ENGINEER

MARCH, 1951

ng 13-Ton Casting . . . page 20

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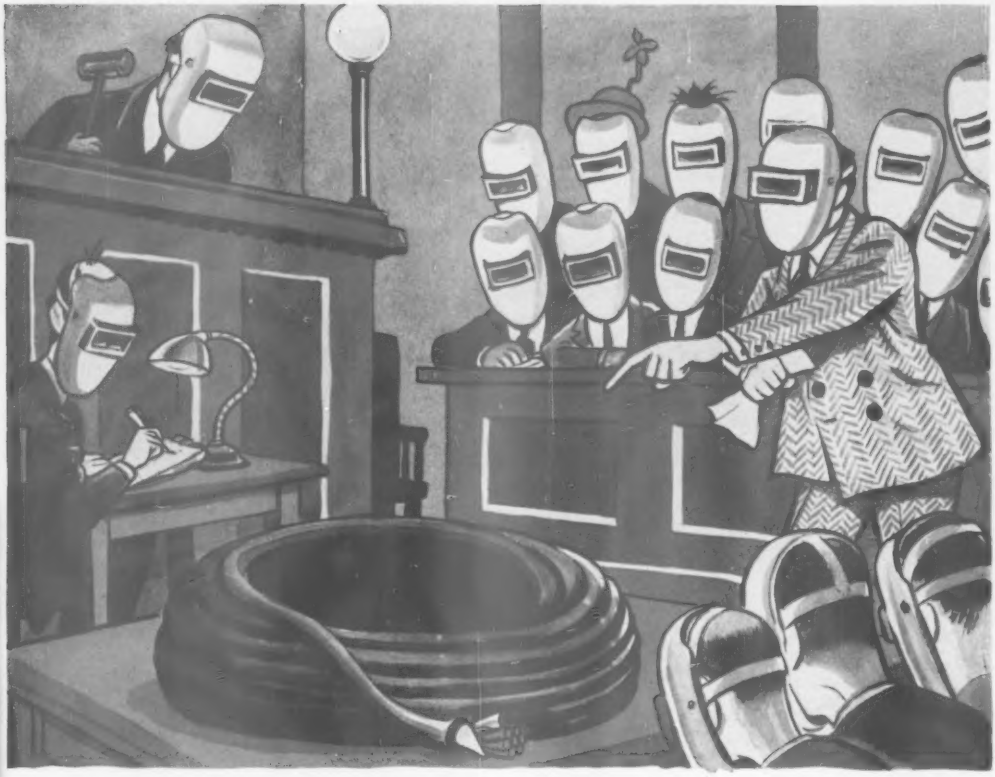

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"Objection sustained."

"How were you made?"

"Objection."

"Objection sustained."

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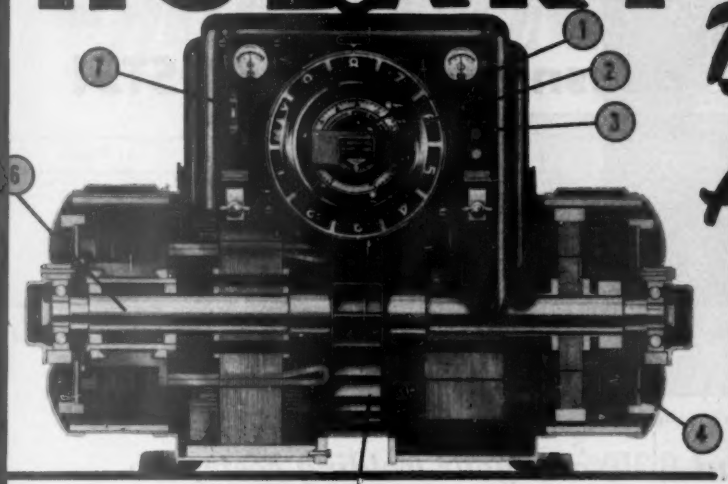

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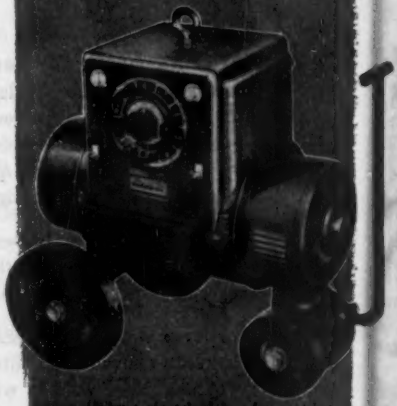

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esn't pay...it COSTS!

"glare" costs because it hides work details, and causes eyestrain and fatigue, all of which lower welder confidence, efficiency and production.

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But **NOW** *you can cut* glare *and your welding costs, too ...with* **CESCO's** **New *Re-Flecto-Ray* lenses**

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MARCH, 1951

COVER: *79-ton spider being welded at the East Pittsburgh plant of Westinghouse Electric Corp. measures some 31 ft in diameter and will rotate at 120 rpm. At this speed, a point on the outer edge will be traveling more than 132 miles per hour. Spider is the inner framework for the 542-ton rotor of a 108,000-kw generator for Grand Coulee Dam power plant.*

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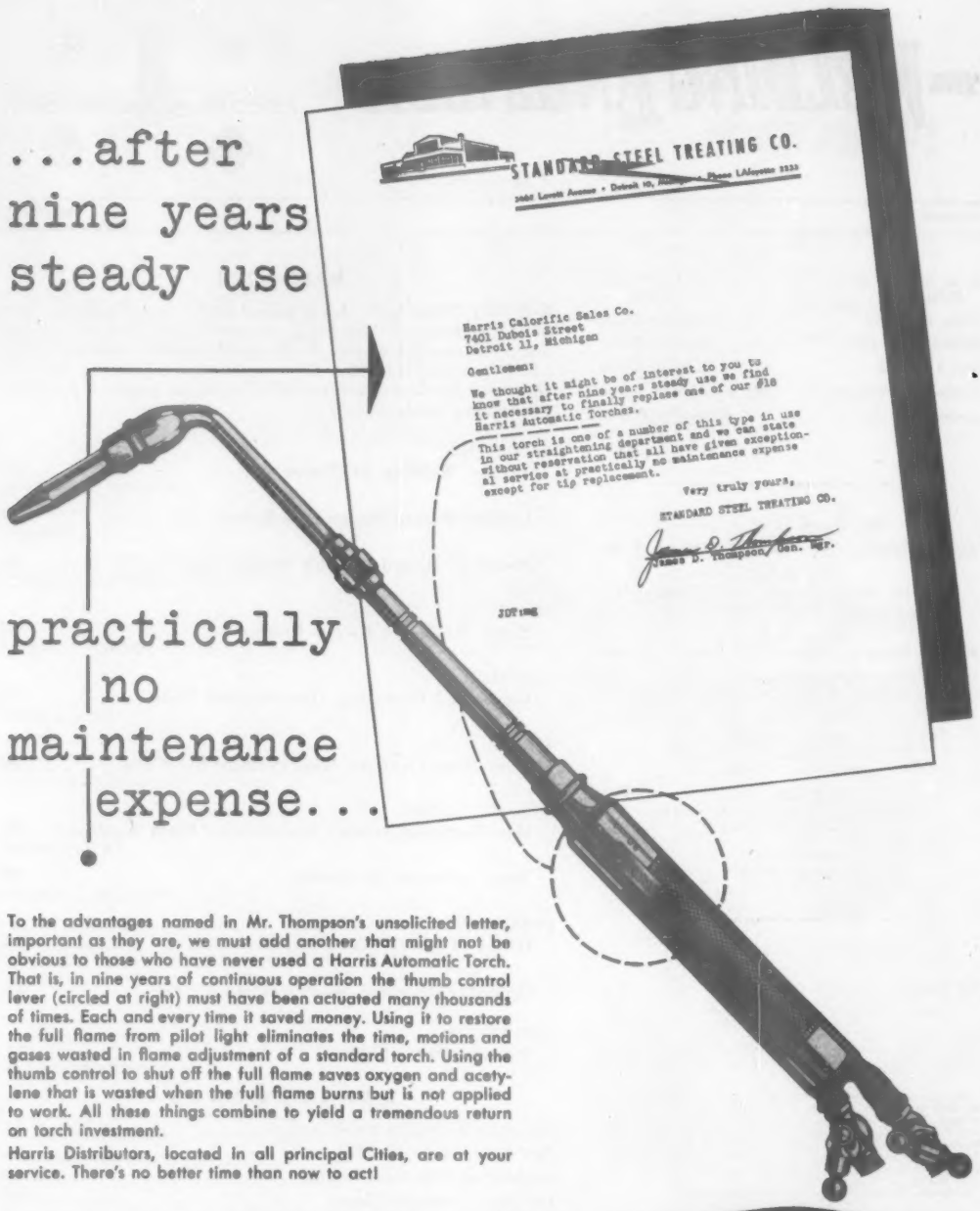
...after nine years steady use

practically no maintenance expense...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Detroit 11, Michigan
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This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.

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Nine welds for 14 cents!

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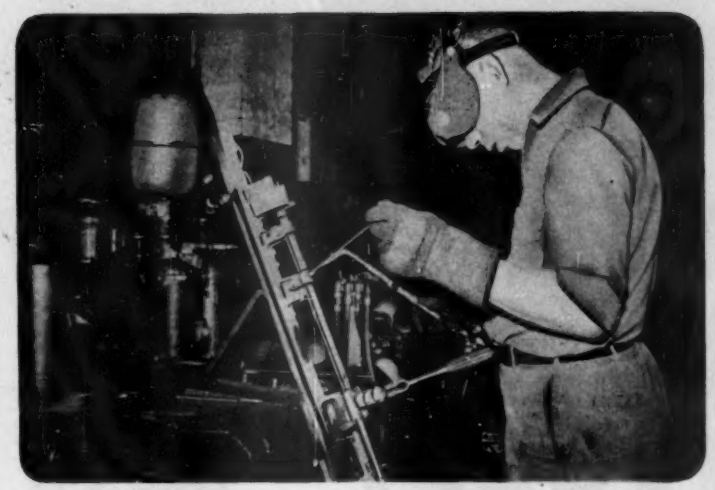

That's all it costs for labor to braze-weld the nine joints required for assembly of this smart tubular steel Collapsible Golf Bag Cart. It's a product of the Lake Manufacturing Co. of Lansing, Michigan and, to make the welds, they used ANACONDA "997" (Low Fuming) Welding Rod supplied by our distributor, Purity Cylinder Gases Inc., Grand Rapids.

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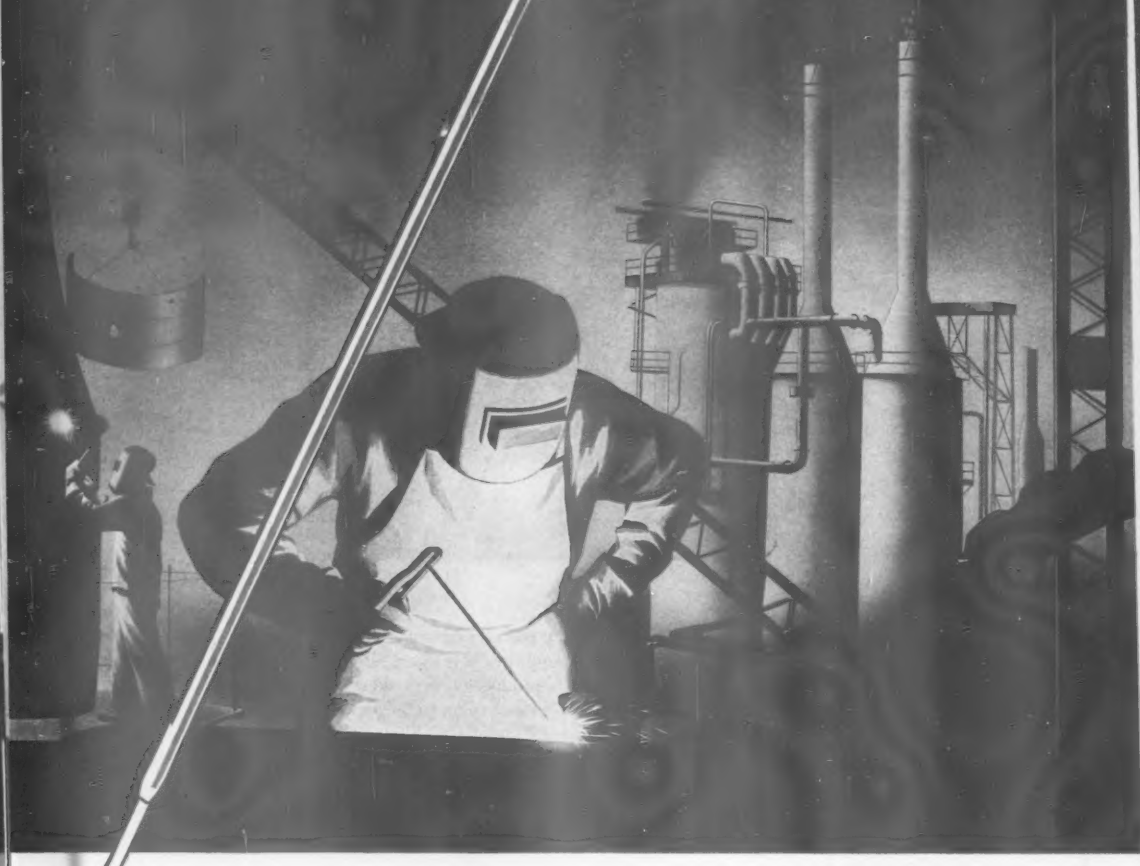

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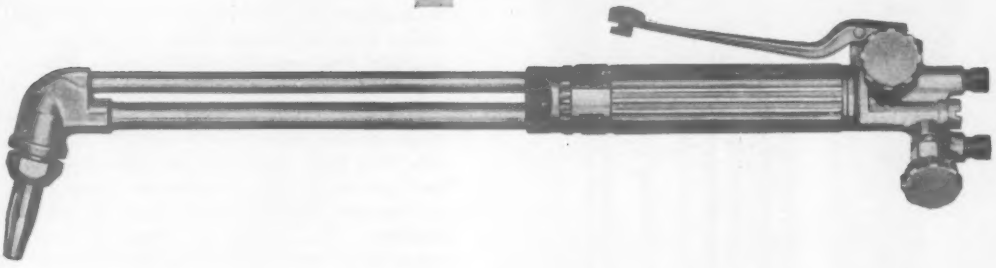

Whether your work includes one or more than one of these jobs, the OXWELD C-32 Blowpipe will save you time and money. This all-purpose cutting blowpipe, with its wide variety of inexpensive nozzles and attachments, easily handles these jobs—and many others—with outstanding efficiency, speed, and convenience.

Like all OXWELD products, the C-32 is built to give you many extra years of economical and **trouble-free service** under every condition of use. Available in your choice of 3 lengths (20-, 26-, and 32-in.) and 3 head angles (75-, 90-, and 180-deg.) to suit your exact needs. Write or phone today for full information about this cutting blowpipe — or regarding welding blowpipes, regulators, cutting machines, or acetylene generators.

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A Division of Union Carbide and Carbon Corporation
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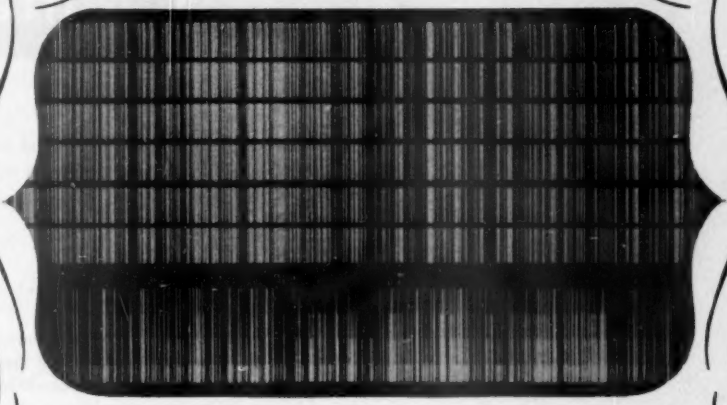
Birth Certificate OF A STOODY ALLOY



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Long a favorite for gas welding and the heaviest amperage welding, this glove of chrome-tanned split horsehide leather provides exceptional heat resistance without excess bulk. One-piece back and palm. All vulnerable seams welted for extra protection. Lining on back of hand is extra heavy.

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3003 ONE-FINGER MITTEN
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SAFETY PRODUCTS DIVISION

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Male flanging die section rebuilt with TOOL-ARC Oil Hardening electrodes. Rockwell "C" hardness 60 to 62, as welded.

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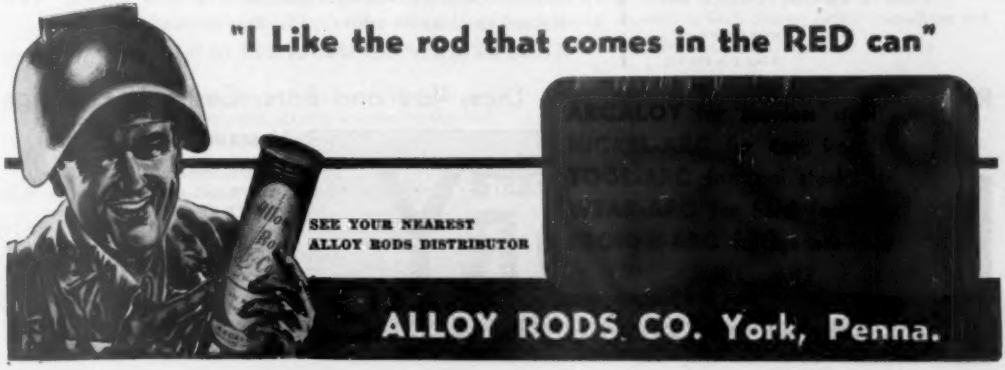

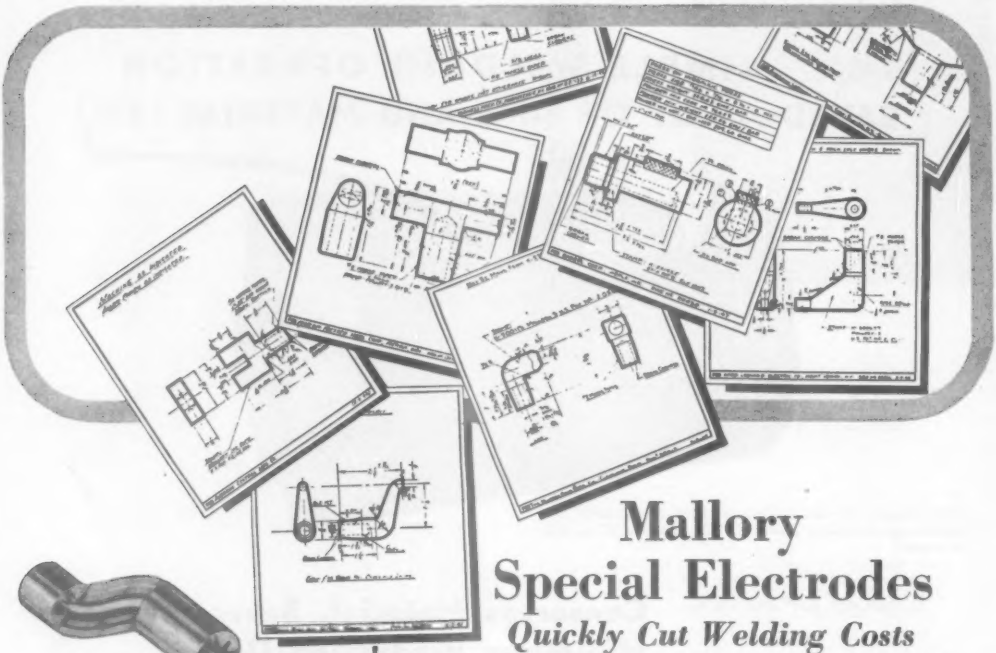

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Quickly Cut Welding Costs For Customers With Special Problems

Thousands of unusual drawings are cataloged and indexed in the Mallory resistance welding engineering files—collected during more than 20 years of Mallory experience in designing special electrodes to handle the tough jobs for which standard equipment was inadequate.

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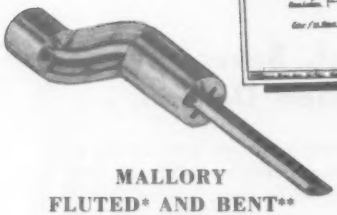
In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry St., Toronto 15, Ontario



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Mallory fluted and bent offset tips are one of the recent Mallory developments. They give you these important advantages:

- Cold bent Elkaloy †A and Mallory 3 †metal standard tips with all the desirable physical properties of full hard, extruded and drawn stock, not obtainable in forgings or castings.
- Water tubes bent in place, bringing effective cooling closer to the welding face.
- Fluted water hole increases cooling area 70% with corresponding increase in heat dissipation.

*Patent Pending
**U. S. Patent 2,489,993
†Reg. U.S. Pat. Off.

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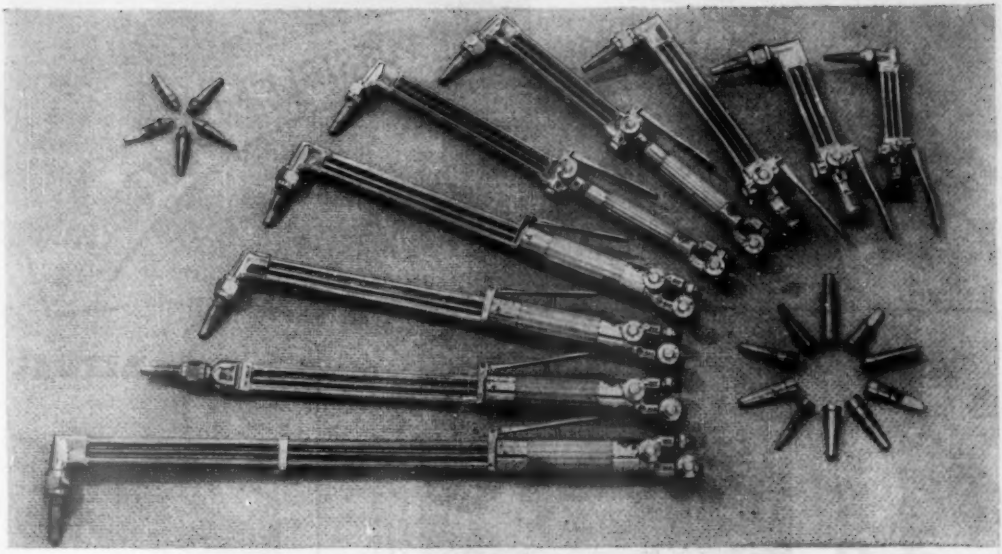


these torches and attachments utilize every useful fuel gas

all cutting torches do look somewhat alike but . . .
there is this important difference . . . some cut better,
more economically, than do others;
and some stay on the job longer.

Here is a line of hand cutting torches and cutting attachments which has proved its ability to perform the expected job *swiftly, effortlessly, safely,* and with a minimum of trouble. Many torches have been copied after these, but none incorporates all of the advantages *NATIONAL* has developed over the four decades of actual field and shop operations in the rugged terrains of the great valleys and mountains of the West.

and, since staying on the job is so important — this will interest you:

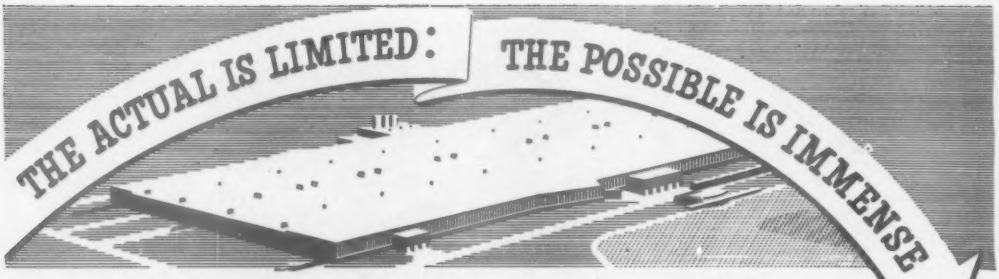
A swift blow with a hammer will restore a damaged tip seat or cutting torch head . . . No other cutting torch can be reconditioned so dramatically, so instantly, so dependably.

But—repair ability, as important as it is, is not the primary feature of these truly fine cutting torches. Their operating quality, their cutting ranges, their fine balance, as well as their proved safety . . . these are some of the many *reasons why you, too, will want to own a NATIONAL.*

These fine cutting torches can utilize any useful fuel gas; and tips of every needed size and type cover the fullest range of operations.

do request a demonstration if you have not yet changed to national

Made by National SINCE 1910 WELDING EQUIPMENT CO., San Francisco 5, California



NEW LINCOLN PLANT CREATED BY INCENTIVE-INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

© LE Co. 1951

Machine frame designed in welded steel maintains alignment to .005"

Textile machine bed fabricated at The Warner and Swasey Company, Cleveland, Ohio, shows cast steel adapter welded to end of frame.

BY redesigning to a simpler, more economical welded steel construction, this prominent machine tool and textile equipment builder now maintains closer production tolerances while cutting the machining time from 8 hours to 2¼ hours. Alignment accuracy, held within .005" and squareness to within .0015 on the 120 inch frame members shown, is maintained with only one roughing and one finishing cut.

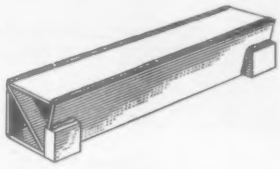
Originally the frame was fabricated from sheared plate using continuous corner welds. The present, simplified design incorporates steel tubing and four angles to which steel castings are welded at each end for subsequent assembly on side frame members.

In addition to saving 170 pounds of metal on each frame, welding time has been cut in half and stress relieving eliminated.

Welding engineers at Lincoln will gladly show you how to design your products in welded steel to improve performance and cut your manufacturing costs. Simply write or call.

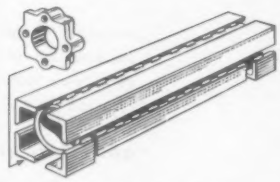
HOW TO DESIGN FOR WELDED STEEL. Latest engineering data, techniques, speeds and costs are presented in the new 9th Edition Procedure Handbook of Arc Welding Design & Practice. Price only $2.00 postpaid in U. S. A.; $2.50 elsewhere.

the ACTUAL



Original Design *of bed frame for textile machine was difficult to machine accurately . . . required stress relieving.*

increasing the YIELD



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ESTABLISHED 1916 THE WELDING ENGINEER MARCH, 1951

Where Are We Traveling?

THE CONSTITUTION of the United States holds that certain inalienable rights of every human being are derived from God. These include the right to live, to hold property and to freedom from unjust imprisonment.

According to the theory (and practice) of socialism and communism, the only rights that an individual has are those granted to him by the State. He is entitled to nothing except what the all-powerful State says he may have. And that usually isn't very much.

We are wondering which of these two conflicting philosophies is prevalent in high circles in Washington these days.

A trip to our nation's capital reveals many disheartening facts. One of the most discouraging is that our national leaders seem to be just as unsure of what lies ahead as the American public. The pilots guiding the American ship through these dangerous waters will answer the most simple questions regarding what to expect with a candid, "I don't know." Yet they do not hesitate to impose curbs and controls when they know neither where we are going nor what is required to take us there.

What we need in this country is more straight thinking. It might be a good idea if our present leadership would devote less time to the planning of reckless spending of money and men and more time to the study of history.

History can be like a road map—to point a way to travel through the confused maze of time. If the road map shows only a bottomless chasm ahead, we should turn back before it's too late.

By "history" we don't necessarily mean ancient history. The Greeks and the Romans are too far away for their problems to have much in common with ours. But let's go back to, say, 1917 and see what the tolerance displayed to a handful of communists did to the government of Russia. Or trace back the history of the proud British Empire for the past fifteen years to find out what socialism aimed at and has achieved there.

Or go back less than ten years, to the beginning of World War II. Haphazard thinking with regard to controls and curbs cost us thousands of man-hours of production. The new controls include the same old mistakes of the past.

Our metals are "scarce" so their use has been restricted. Aluminum, for example, is banned from the manufacture of 200 civilian items, beginning with airfoil tubing (for windmills) and continuing straight down the alphabetical line to wheelbarrows and whistles. Yet nowhere is there any suggestion of the possible savings of critical metals that might be effected by the use of welding.

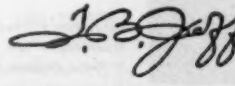
Fabrication by welding, where it is applicable, would make it possible to spread the curtailed metals 10% further since welded fabrication usually requires only 90% as much material as other joining methods.

Also, the present single-band priority set-up fails to provide for maintenance and repair welding, an absolute necessity of our industrial life. What's going to happen when machines break down if there's no welded repair?

Something has to be done to awaken production authorities to the dangers of such a shortsighted policy. Somebody has to do an educational as well as a selling job, and that somebody is we of the welding industry.

Even though our leaders have failed to read the signposts of history, we must not let their lack of knowledge of the advantages of welding impair our national progress. We in the welding industry must take on the responsibilities of leadership. We must show production authorities the way to the greater conservation of vital metals that is made possible by the judicious use of welding. We must point out the codes and specifications that have been evolved to cover practically every welding need.

If it is necessary that we conserve metals, let's do it in the most effective way through economical fabrication. Nothing offers the advantages of welding for production, maintenance or repair applications wherever metal parts are joined.



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Welded wrought-iron lines serve new Hospital Buildings

Underground tunnels at Cleveland's City Hospital contain the old and the new in piping. New 125-pound steam main (Fig. 1) serving several new buildings is welded. A welded system with TUBE-TURN Fittings was chosen to cut installation time, and to get tight, leakproof joints.

New welded line (Fig. 2) elbows neatly over an older pipe. When space is confined like this, welding is the answer. Contractor welded pipe from 2" up to 12" in tunnels, boiler room and power house.

With welding equipment on the job it's easier to put up pipe supports too. Eyebolt (Fig. 3) is quickly welded to TUBE-TURN Elbow, support rod hooked through it. This steam line to the water heaters must be secure.

Insulation on the maze of piping to the boiler feed pumps (Fig. 4) went up fast, with no flanges to work around. In such close quarters a neat design and reduced space requirements are especially important. And with the pipe welded to TUBE-TURN Fittings, joints won't leak, and insulation will last.

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Fig. 1. Welded underground steam main.

Fig. 2. New welded piping fits in small space.

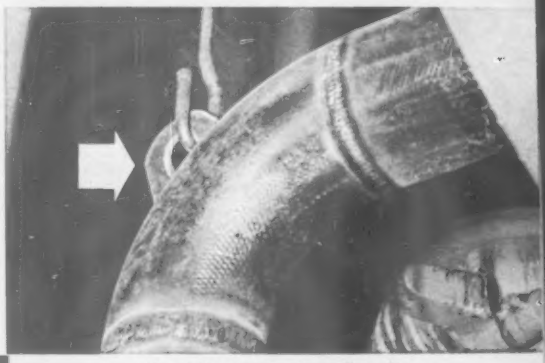

Fig. 3. Support on steam line elbow.

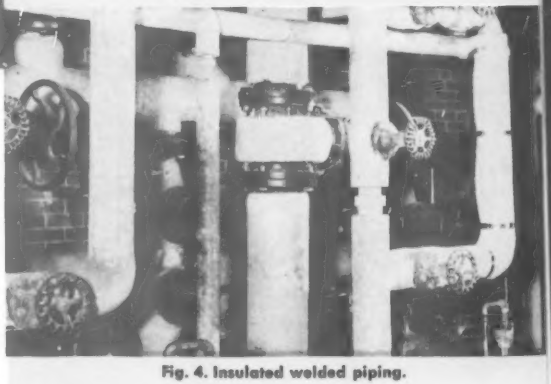

Fig. 4. Insulated welded piping.

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Tricky Welding at Tecler

Tecler makes window frames by welding aluminum extruded sections. Parts are held for welding by jigs, but in one case it proved cheaper to hire a man to do the holding. Turn over the page, and you will see why. . .

BY HOWARD E. JACKSON

TECLER Aluminum Products, of Seattle, Wash., manufactures stock sizes and types of aluminum frames for windows and doors designed for everything from the most modest home to the largest estate. Custom-built windows and doors are also made.

The welding of aluminum windows and doors is often tricky. Narrow corners are a feature of Tecler construction. Many regular and irregular sections of bar members must be welded. It is little wonder that at times welding is ticklish and calls for highly skilled craftsmen. Gas welding, metal-arc welding and inert-arc welding are all called upon during the fabrication.

From Storage to Presses

The extruded stock for the frame and Z-bar sections is trucked directly from the mills. The 300-lb bundles of stock are placed on a series of racks running the entire width of one end of the hangar-like building. The racks are parallel to the long tables containing the miter saws. Shapes not commonly used are stored in a balcony directly overhead.

The windows are "born" in the sawing section. Four drop-head saws miter the ends of the extrusions and cut them to length. One set of saws is tied together to do the principal cutting of residential sections; one operator on this double saw can send through cut members for 150 frames a day.

The frames, muntins (sash bars), vent bars, etc., for the aluminum windows and doors are extruded aluminum alloy 63S-T5. Thicknesses vary: architectural vent and muntin bars are not less than 1½ in. deep and ⅛ in. thick; residential bar sections are not less than 5/32 in. thick and 1¼ in. deep plus the mold section.

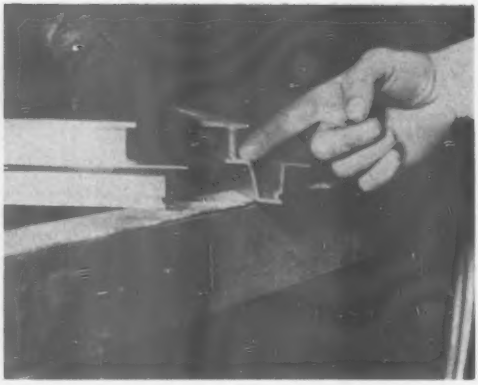
No matter what the type or size of window, its manufacture follows much the same course. Corners of frame members are mitered and welded, muntin bars are coped, tenoned and riveted; windows are prepared for outside putty glazing (or inside glazing or continuous aluminum glazing bead).

Presses, Milling Machines

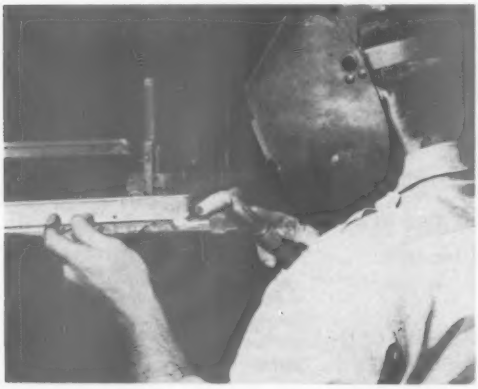
The main fabrication area is small but compact. If a person walks past the sawing tables to the side of the building opposite the receiving door and then turns around and walks back past a row of specialized machines, he will have covered the principal production section (excluding subassembly and final assembly) and yet won't have walked 80 ft. On such a tour, he will have passed a number of punch presses that range in tonnage from 7½ to 30. All but one of these presses are tooled to perform single or multiple operations without any changing of dies. Since the dies are never changed (except for maintenance) tear-down and set-up time are eliminated. Also, there is a smooth flow of work, made possible by rigging up these machines to do specialized jobs.

Mixed in with the punch presses are a half dozen shop-made or converted machines, mostly milling. They are equipped with triple cutters, double heads and all sorts of multiple set-ups to assure economy as well as quality in the making of aluminum windows and doors. Everything is

1—IT'S CHEAPER to hire a man to hold these corners than to use a jig. Helper wears absestos gloves



2—FINGER POINTS to thickest part of section in picture 1. Weld starts at this thickest middle part



5—LIGHT BARS are fastened to heavier members by means of inert-arc welding to give rigidity to joint

6—SIMPLE JIG for welding pads onto pipes saved labor of one man. The pipe serves as corner mullion

Gas welding, inert-arc welding and metal-arc welding are all needed

so compact that there is no need (and no room) for power trucks; small hand carts are simply pushed a few feet from one operation to the next.

The firm believes in improvising to meet production requirements. By evolving better methods as it goes along, Tecler has been able to increase its volume over five times in the four years of its existence. The distribution of Tecler products, which started in the home city of Seattle, has today spread throughout Washington, Oregon and California and to parts of Utah and Idaho.

The punch presses and milling cutters perform such operations as slotting the frame and Z-bar sections, punching out holes in the proper places, milling out spaces, etc. After the bars are pierced and slots punched, the job number is put on the frames and the parts are ready for welding.

Tricky Gas Welding

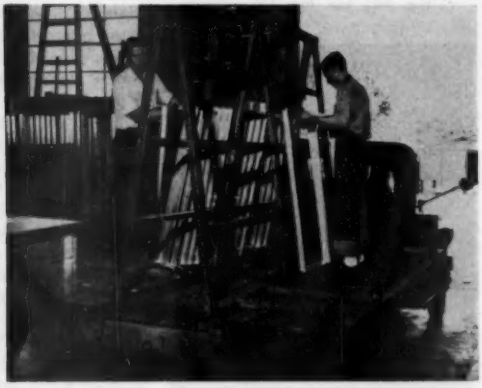
The welding areas are just as compact as the production line for machining operations. The arc and inert-arc welding units extend along one wall, and the oxy-hydrogen equipment is strategically located in final assembly near the center of the building.

Careful study was made to figure out the fastest, most economical and durable manner of making the welds. The problem is complicated by the irregularity of the sections to be welded. Let us look at some of the most intricate welding (Fig. 1) performed by the weldor and assistant who gas weld together the corners of frame and vent sections. The sections are 5/32 in. thick on top, ½ in. thick in the middle and 3/16 in. thick at the bottom. The very irregular edges are welded as mitered. While the helper is positioning the bars with asbestos gloves (tongs during the final stages), the weldor preheats the section corners for 15 seconds at 800 F. An oxy-hydrogen flame is used in-

3—PARTLY WELDED section. Time studies showed it was cheaper to employ two men than one man with a jig

4—ANOTHER TEAM of two men welds Z-bars together and can turn out 80 to 120 frames a day. Jig is used

7—BAND SAW with a self-contained welding unit for saw blade cuts out the pads welded in picture No. 6



8—FINISHED FRAMES here are not crated as they are for local distribution. Note level of truck bed

stead of the usual oxyacetylene flame.

Welding takes 25 seconds and is done at temperatures of 400 F on the outside and 1,100 F at the thickest point on the inside. The weld is run down from the thickest point to the bottom, then back to the thick middle section and then to the top. In Fig. 2, the finger points to the thickest part where welding was started. All welds are made downward, and inasmuch as there are really three welds in one, the weldor does not have to worry too much about penetration. The material is 63S-T5 aluminum, for which a 2S half-hard filler rod is used.

Because of the irregular shape of the frame bars, the shop would be hard put to make a jig that would hold the work; also the heat would travel back along the channels to the assistant. Consequently, the helper holds the bars. During preheating and for the first weld, asbestos gloves suffice, but from then on he grips the bars with shop-made tongs. The tongs were made by welding 1-in. pipe and two muntin bars together. They adequately hold shut the top, where a gap might appear during the early stages of welding. Fig. 3 shows a close-up of a partially welded frame section.

Made Time Studies

The various steps have been worked out to the split second. Time studies revealed that the most economical production method was to employ two men without jigs. It is a different story, however, when the same men weld vent Z-bars, which have a more regular shape than the frame bars. The procedure is quite different. The weldor sits; a jig holds the bars, and the helper stands and works barehanded. The gas welding of these corners is similar to the heavy welding on the frame bars; the weldor starts near the bottom and runs the weld up to get more penetration, using a downward stroke. The helper's hands are safe, for no heat can get back of the jig in the short time it takes to make the welds.

Another two-man team welding Z-bars together (Fig. 4) uses a similar but slightly different gas welding procedure. The weldor starts the weld at the middle and works up and out; then he goes back to the middle

(*Continued on page* 22)

Braze Welding a 13-Ton Casting

To do this big repair job called for a preheat of three hours and a long slow cooling. Altogether, 325 lb of manganese bronze were deposited in a crack 2 ft long.

BY FRANCIS L. MAIER

OVEN FOR preheating was built around cracked portion. On floor is the outer ring, also a part of casting but too big for furnace

OPEN VEE with bottom plate to hold weld metal at start of weld

Pertinent Facts

Type of metal	cast iron
Weight	13 tons
Vee in crack	60-deg included angle
	5½-in. face
	7 in. deep
	2 ft long (high)
Charcoal briquets, 19 bags, 20 lb each	Total 380 lb
Welding rod (manganese bronze)	
	¼ in. 100 lb
	⅜ in. 225 lb
	Total 325 lb
Brazing flux	2½ lb
Oxygen consumed	1,056 cu ft
Acetylene consumed	1,250 cu ft
Heating time	3 hours
Welding time	16½ hours
Total time on job	19½ hours
Operators	two

TIME and time again it has been proved that welding can reclaim equipment at a fraction of its original cost and with a minimum of down time. Furthermore, welding has reclaimed objects that could have never been replaced because they had become obsolete and parts were no longer manufactured.

As an example of how a welded repair can vitally affect an entire community, let us consider a job of ours. My colleague Norman E. Smith and myself operate a welding business at Joliet, Ill. We received a call early in the spring from a southern Illinois limestone quarry that specializes in agricultural limestone. The primary crusher, weighing about 75 tons, had cracked through the top casting or "crusher spider." The cracked casting itself weighed about 13 tons. Its purpose was to house the top bearing of the crusher gyrator.

Trouble for Farmers

The quarry people were plenty worried. It was a good-size quarry and had been in operation for a long time. Situated near a small town, it was the source of livelihood for most of the town's inhabitants: if the quarry shut down, most workers in town would be out of a job. Even worse, though, was the hardship that would be caused the farmers. The crusher had picked the worst possible time of the year to break down. The farmers had started to spread limestone over their land, and the quarry was their main source of supply. Unless the crusher could be quickly repaired, the farmer was certain to suffer. And a great loss of business would be experienced by several small trucking firms, who would have no limestone to haul. It was a perfect example of how everything in this complex civilization of ours depends on something else.

Norman Smith and myself drove immediately to the quarry to see what could be done. The crack in the 13-ton casting was in the left center of the bearing housing. That crack was two feet long and looked as though it could swallow up several hundred pounds of filler metal. Oxyacetylene braze welding, of course, was the only thing that could be done. We didn't even consider any other repair method.

When the spider had been removed from the rest of the crusher, we set to work to vee the edges of the crack. We marked in soapstone the outline for a vee with a 5½-in. face and a 60-deg included angle. Our big problem was to avoid breaking off a large piece of cast iron. If a large piece broke off from the bearing surface on the inside, the casting would have to be sent out for an enormous machine job on the bearing. With time of the essence, machining simply had to be kept to a minimum.

Chipping the Vee

Here's how we made sure. First, we used an air-operated drill to drill holes 1 in. in diameter and spaced 2 in. apart down the center of the crack and on the outer edges of the 5½-in. face. The drilling was done on both sides and for the entire 2-ft overall length of the crack. After the holes were drilled, we chipped out the cast iron between them with air-powered chipping hammers. We didn't try to chisel out all the metal because of the danger, previously mentioned, of breaking a large piece out of the bearing surface. The last 2 in. or so of iron at the back of the vee were washed out with a metal arc, using a ¼-in. E-6020 (heavy coated) elec-

NEARING TOP of vertical weld. Weldor on the left is Francis L. Maier; on the right Maier's partner Norman

E. Smith takes his 15-minute shift. Note firebricks built around the completed portion of the braze weld

trode. Though this may seem a bit unusual, we have been using this type of electrode for several years for such jobs and have found it both efficient and economical. The machine setting was 300 amp, straight polarity.

The walls at the back of the vee were washed out to a tissue-paper thinness. At some points small holes were pushed through, but we never broke off a large chunk as we had dreaded.

Some machining, of course, could not be avoided. The bronze was sure to come through the back of the vee, as the cast iron there was so thin that the heat of the torch would burn it through as the weld progressed. However, the deposited metal could be ground to the bearing contour. The important thing was to see that there wasn't too much of it.

Building an Oven

When the edges had been prepared, our next step was to build an oven for preheating. We stacked firebricks four high and 2 ft apart to support a piece of ½-in. plate cut approximately 8 ft long by 5 ft wide. Without this plate to bring the preheating elements up closer to the welding area, the fire would have had to have been twice as large as it was. Over the plate we laid a floor of firebrick (one layer of bricks) and then built up the walls around the casting in an egg-shaped outline, leaving an opening for the veed edges of the casting and also six draft holes.

The walls were built up eleven bricks high (about 3 ft). The draft holes were openings 2 by 6 in. left in the first row of bricks above the floor on both sides. The three holes on one side of the wall were located directly opposite the three holes on the other side.

We cut another piece of ½-in. plate to the shape of the vee and blocked it to the bottom of the casting, immediately under the vee. This was done to start the weld, which was to be run up in the vertical position, beginning at the bottom. Our plan was to fill up each section of the vee completely as we worked on it—in effect a one-pass weld.

Since we had to get close enough to the casting to weld, we could not put the outer ring into the oven. Fortunately, this outer ring was split at the center on two opposite points. It was kept in place on the crusher by 2½-in. bolts at the split. We removed the bolts in order to allow for expansion of the ring. During the process of heating and welding, it expanded by 4 in. And it was exposed only to the atmosphere and not to the oven heat.

For preheating, we took ten 20-lb bags of charcoal briquets and spread this 200 lb of charcoal evenly across the brick bottom. Then we covered the top of the furnace with ¼ by 36 in. asbestos paper, using up an entire 100-lb roll. We kept one strip of asbestos paper to cover the vee and to protect us from the heat we knew would come out of the opening.

We lit the oven with our oxyacetylene torches through the draft holes. As soon as some of the charcoal was on fire, we fed compressed air through the holes at a low pressure in order to speed things up. When a good start had been made, however, we let the charcoal burn its own course, aided only by the natural draft. We wanted the casting to get a good soaking heat so it would be at uniform temperature.

It took three hours to bring the

BIG JOB is done at last! Completed weld is slightly to left of center

casting to the proper preheat temperature: between 900 and 1,000 F. To do the braze welding, we used a general-purpose torch with a two-stage regulator. The filler metal consisted of 36-in.-long manganese-bronze welding rods, ¼ and ⅜ in.

Curtain for Welding

We started the weld at the back edge or point of the vee and built out slightly over the outside edges to allow extra metal that would "wash down" when the weld was completed. As we welded, the asbestos flap was hanging over the top and down the front to form a curtain that was open only where the weld was being made. As the weld progressed, we pushed up the flap of asbestos paper and built up the bricks in front of the completed weld. This kept in the heat and also helped to keep it away from the weldor. Nevertheless, the heat was terrible. We had to relieve each other every 15 minutes, which was as long a period as either Mr. Smith or myself could stand.

We started out with a No. 10 torch tip and ¼-in. rods. After we had gone up about 6 in., or a fourth of the total distance, we switched to a No. 12 tip and ⅜-in. rods. The long rods (36 in.) are the standard length we use for all such work.

The same two weldors, alternating every 15 minutes, filled in the whole vee in 16½ hours of continuous welding. This time also included washing down and shaping the contour of the casting and removal of the ½-in. bottom plate.

Slow Cooling Vital

After the welding was done, we added more charcoal to the oven; it was an important part of the job to keep the fire from going out too soon and allowing the casting to cool too fast. By the following morning, the casting had cooled so you could put your bare hand on it, and the machinists took over to grind the bronze on the inside bearing surface. They needed only 1½ hours for this. Before afternoon, the spider was set back in place, and the crusher was running again. It has been running 24 hours a day for nine months and shows no sign of cracking again near or through the weld.

The sum and substance of the whole job is given in the tabulation on page 20.

TRICKY WELDING

(Continued from page 19)

and works down and out to keep the sections from cracking. Since there is more area to weld and the heat is greater, the helper uses asbestos gloves even though a jig holds the work. In all gas welding, the 2S half-hard filler rods are used in all cases as they are easy to handle and flux easily. The weldors flux the rods as they go with aluminum welding flux.

These two-man teams each turn out 80 to 120 frames a day—all corners welded.

Inert-Arc Welding Jobs

Inert-arc welding is used to fasten lighter bars to heavier bars. It gives rigid joints, unlike gas welding, which would melt the parent material as the flame spreads. The inert-arc torch is used for all welding work of this sort where it is necessary to control the heat so frames cannot possibly warp. One man does the welding, setting the bars in a fixture in front of him (Fig. 5). He uses a ⅛-in. 2S half-hard filler rod with a tungsten electrode. The machine is set according to the penetration desired (generally at the low or 130-amp range). When the mitered edges are firmly clamped in place in the jig, the weldor starts on the outside crack, lays down a small weld and works right, then left of the crack. If he were to start at the right and work across the crack, he would have to hesitate long enough to warm up the left side, and even this slight amount of heat would burn through the material. It takes the weldor but 30 seconds for each weld, and there is no distortion nor buckling. (This weldor has welded ⅜-in., 5 by 5 in. pads together using the inert-arc method, but this is not a part of regular production.)

To clean up the welds, filing is done; as most of the welds are hidden, little filing is necessary. The welded frames and Z-bars are washed in hot water and brushed to remove all traces of welding flux, which would eat into the aluminum when wet. When the frames have been welded, they are ready for muntin fittings and then for vents and final finishing.

Metal-arc welding is employed to weld steel pads onto the ends of steel pipes (Fig. 6). The steel pipe will later be covered with aluminum to serve as a corner mullion—to get the narrow-corner effect of Tecler windows. A band saw with a self-contained welding unit for the saw blade cuts out the pads (Fig. 7). The pads are ¼-in. plate, 4 by 4 in. for frame construction, and ⅜-in. plate, 5 by 5 in. for veneer construction. The pipes are 1½ in. IPS.

A simple right-angle jig holds the square pads in alignment while they are welded. At one time two men did this welding, but the simple holding jig eliminated one man. Welding is accomplished with a 300-amp d-c welder, set according to the type of weld. Strength is not too essential.

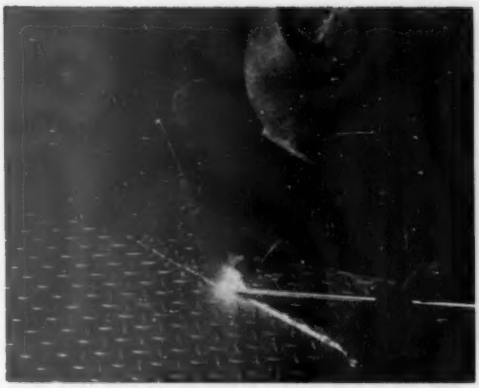
A ⅛-in. E-6010 electrode is used. After one pad has been welded to the pipe (previously cut to length), the pad and pipe are painted with zinc chromate, and the aluminum covering is slipped over the pipe. The mullion is then turned upside down, and the pad at the other end is welded on and painted with zinc chromate. The mullion is then ready to be drilled, tapped and fitted.

Electrodes Kept Dry

An aluminum box was built to sit on top of the welder used for this work. It contains an electric light bulb and a supply of electrodes; the warmth of the light keeps the rods dry.

The vents and frames, made up in subassembly by the methods described, flow directly to final assembly. This includes necessary tapping and drilling of holes for the hardware, putting in beading for glazing, straightening out corners and general clean-up work. Holes are drilled for screens, which Tecler does not manufacture. The windows are then ready to install.

Inasmuch as there are several types (side hinged, awning windows, etc.), each of which comes in a wide variety of shapes and sizes, crating and shipping is no small problem. Metal straps hold the frames and pieces together with padding to keep them from rubbing and then the windows are crated or cardboard wrapped, as the case may be. They are then loaded directly onto trucks (Fig. 8), beds of which are flush with the floor of the shipping and crating department.



1—INERT-ARC torch welds 5/8-in. plate. Torch was taped for extra insulation and thumb switch provided

2—SMALL DOCK BOARD reinforced by channel and by extra plates below. Bench is at convenient height

Lighter Weight Means Less Labor

Magnesium dock boards save time and cut down on injuries in loading and unloading ships. A-C high-frequency machines give good welding results.

BY J. R. THORPE
Production Manager, Magline Inc.

MAGLINE INC., of Pinconning, Mich., fabricates dock boards up to 24 ft long and 10 ft wide from rolled magnesium plates and extruded magnesium channels and I-beams. Dock ramps of similar construction are also fabricated on a production basis.

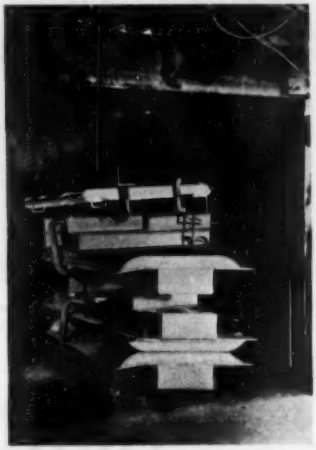
These all-magnesium products are strong, sturdy, stiff and long lived. Their great advantage, however, is that they weigh only about a fourth as much as steel. This means easier handling and less labor for moving the dock boards in service. For workers, it means that strained backs, hernias, mashed fingers and other such injuries are much less likely.

WELDED WITH ARGON

The joints are made by a-c high frequency arc welding, using argon gas for shielding. All of the welding is done by hand because the work varies too much to permit an automatic set-up to be installed. Tungsten electrodes of 1/8, 3/16 and 1/4 in. are employed. Torches are modified by additional tape insulation (Fig. 1), and each torch is equipped with a thumb switch to shut off the current when welding stops. This little feature permits the weldor to lay the torch down on the work or on a bench instead of having to step back to hang it up. The several makes of welding machines employed are adjusted for currents of 110 to 550 amp, depending upon the thickness of magnesium that is being welded.

The material is a magnesium alloy meeting ASTM specification AZ31. Its nominal composition is 3% aluminum, 1% zinc and the remainder magnesium. Plates up to 5/8-in. thickness are welded. The plate edges are beveled to provide a V-groove. Where reinforcements are needed they are usually made of extruded magnesium channels or I-beams or with strips cut from plates, depending upon the design and the load to be supported.

Welding is done on low benches (Fig. 2) at a height most convenient for the weldor. As previously mentioned, the work varies constantly to meet varying customer specifications.



3—STRESS-relieving oven: dock boards are clamped to stiffening beams to avoid warpage from heat*

MUST BE STRESS RELIEVED

When welded, the dock boards are clamped to stiffening sections (Fig. 3) to avoid warpage when they are set in an oven for stress relief. The relief of welding stresses is accomplished by holding the work at 400 F for 1½ to 2 hours before it is allowed to cool to room temperature. The products are ready for shipment as soon as they're taken from the oven.

*Photos courtesy of The Linde Air Products Co.

1 WEIGHING powder. Composition is controlled to give detonating velocity of 3,250 meters per sec

2 FOUNDATION for welded test plate. Steel bars are laid to make a hollow square with 16-in. sides

5 SILICA SAND around charge helps detonating wave form be a uniform wave of equal intensity

6 FUSE to primacord detonator has just been lit; operator has one minute to run to safety before

Controlled Explosions

BY JACK MEDOFF

THE DIRECT EXPLOSION TEST originated during World War II as a means of evaluating the performance of armor and ship-plate weldments. Unlike the conventional ballistic test, it is not affected by the variables inherent in a method that depends upon projectile impact. Direct explosion produces a controlled energy release at a controlled location.

SUPPORTING TEST SPECIMEN

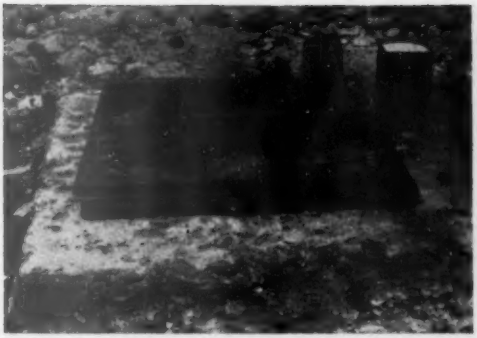
Briefly, the method consists of detonating an explosive charge in direct contact with a test plate. The specimen is supported along its four edges by a sturdy steel and concrete structure. First, a concrete platform 6 ft square is made to support a 3-in.-thick plate of high-tensile steel, 3 ft square. Four steel bars, each 4 in. high by 2½ in. wide, are laid upon the steel plate to form a hollow square with sides measuring 16 in. inside and 21 in. outside.

The specimen, a plate 18 in. square, is placed over the bars so that it overlaps the 16-in. hollow square by an inch on each side. The charge is put in the center of the specimen and is surrounded by approximately 40 lb of white silica sand, held in place by a paper cylinder 8½ in. in diameter by 12 in. high.

A special detonator explodes the charge in such a manner that the front of the detonating wave reaches the face of the specimen nearly simultaneously over the entire area underneath the explosive container. The impact of the wave first bends and then stretches the plate equally along its two axes; the amount of deformation is nearly linear with the grams of charge.

To find the minimum charge necessary to fracture a particular specimen, a number of identical specimens are subjected to the action of progressively larger charges until fracture occurs. Each specimen is subjected to the action of only one charge.

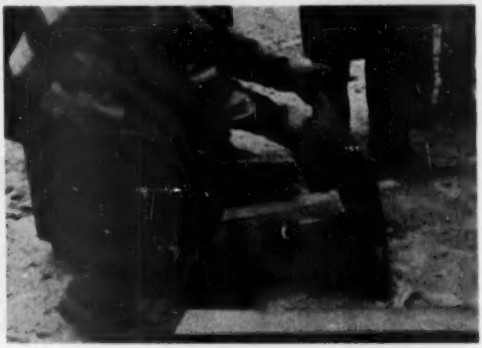
The Ship Structure Committee, a body made up of representatives of the Bureau of Ships, Coast Guard, Maritime Commission, Military Sea Transportation Service and the American Bureau of Shipping, is sponsor-



3 PAPER CYLINDER, primacord detonator and box of sand to surround charge in the oatmeal container

4 TEST PLATE has been rushed from the cold box to the explosion site on the wagon shown at right

7 TIMBER . . . or THAR SHE BLOWS!



8 EXAMINED, test plate shows good ductility, as is evident from the dishing. It did not fracture

Test Welded Plates

ing a testing program to establish whether or not it may be possible to improve the overall performance of a completed structure by relatively simple modifications in electrode composition and welding procedures. Results to date indicate that it is possible. The particular test pictured showed that the E-7016 low-hydrogen electrode is apparently superior for use with ship plate.

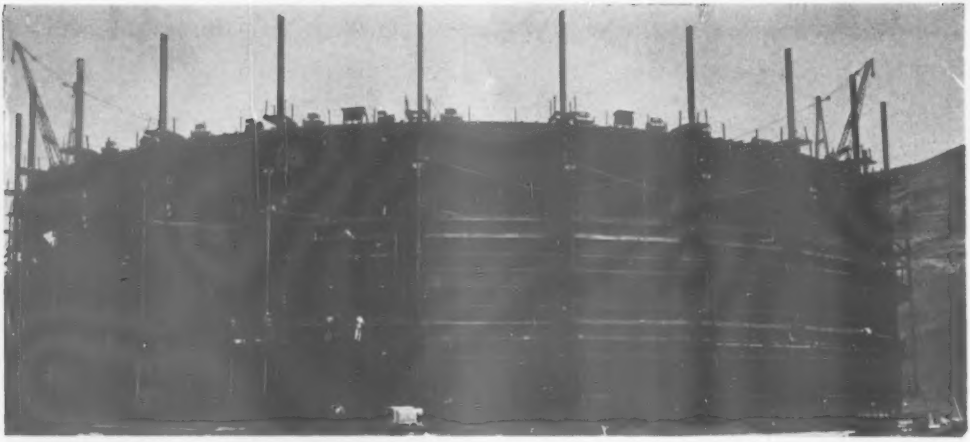
Controlled Temperature Range

The tests were run by E. A. Thorne Enterprises, Inc., and supervised by G. S. Mikhalapov. Mr. Mikhalapov is technical director of the Metallurgical Research and Development Co., Inc., Washington, D. C., which has a contract for the test work with the Bureau of Ships. Site of the operations was an abandoned quarry near Allentown, Pa.

Powder charges were prepared in a small shack on the quarry, which primitive building also contained the cold box for holding plates that were to be tested at low temperatures. The source of cold for the cold box was provided by continuously vaporizing dry ice. The temperature was regulated by intermittent operation of an electrical heater and blower, thus permitting a range of test temperatures from —90 F to about 200 F. In no instance did a greater time elapse than three minutes between the removal of the plate from the cold box and the explosion.

A member of Thorne Enterprises, Inc., carefully weighed out the explosive powder charges inside the quarry shack. Composition of each charge was controlled to give a detonating velocity of 3,250 meters per second. W. A. Snelling, president of Thorne Enterprises, took over the ticklish business of packing the mixed powder to a uniform density. A cardboard oatmeal container held the charge; the packing procedure was to lift a weight to a predetermined height and allow it to fall—ten times for each charge. Charges may vary from 60 to 1,000 grams of powder.

In the particular test pictured, the explosive charge was 320 grams and the test plate was at a temperature of 10 F. The 320-gram charge was below rupturing value, as you can see from picture 8.



THREE-LEVEL scaffolding hung from roof supports a vertical assembly line. Note the welding machines at edge of roof—56 of them were used. Derricks were installed on a monorail that ran around the roof's edge

They Hung from the Roof to

To build this 385-ft-high gas holder, weldors worked from three levels of scaffolding lifted by a new kind of sky hook—the roof on an air-pressure elevator.

BY MARGARET RALSTON

KEY UNIT in a 17,000,000 cu ft gas holder recently completed at Richmond, Calif., is the piston. This 254-ft steel disc (the full diameter of the holder) rides on the gas and serves as a seal at all levels.

That piston was made to lift the roof as it journeyed skyward. A pressure equivalent to 13½ in. of water sufficed to lift the 3,500,000-lb weight of the roof-piston-monorail combination. In this novel method of construction, the roof was built first, and the workers hung from the roof to build the walls. Yes, literally.

This topsy-turvy way of doing it offered a number of advantages. Considerable savings in the total number of ft-lb lifted were effected by building the roof near ground level instead of lifting everything that was needed 385 ft to the top. Wage savings also resulted—premium pay for work at high levels was kept to a minimum. Finally, the cost of scaffolding was nearly eliminated.

LAP WELDING of 3/16-in. roof plates begins as piston-roof structure is assembled. Note the I-beam columns that tie piston and roof together

Piston-Roof Assembly

Koppers Co., Inc., which built the $5,000,000 holder for the Pacific Gas and Electric Co., assembled the piston just as soon as the concrete foundation had been poured. The bottom plate for the piston was lap welded of ¼-in. steel. The plate was separated from the concrete on which it was assembled by a 1-in. leveling cushion of sand.

The roof was built on top of the piston, and the two units were fastened together for the building period with temporary structural links. I-beam columns were set at the corners of the 28-sided polygon, and the piston-roof assembly was held to these verticals by sliding yokes and clamps.

Each tier or course of 3/16-in. shell plates was a uniform 40 in. high, all the way up. When the first 40-in. plates had been placed and welded, the piston-roof was pushed to its top by air pressure and anchored there until the next tier was com-

WELDING UNDERSIDE of piston truss center ring. Piston is a trussed steel disc the full 254-ft diameter of the holder. It serves as gas seal

WELDOR on second level finish welds a 3/16-in.-thick shell plate

Build the Walls

pleted. As each successive layer was added, the roof was raised another 40 in. until it reached the top of the holder. The temporary construction links were then removed, and the roof was permanently welded into place.

The "sky hook" roof was fitted out as a working platform. At 46 ft from ground level, a monorail was built around its circumference and two traveling derricks were installed to lift construction members.

Vertical Assembly Line

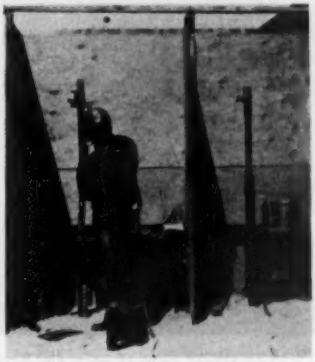
Three levels of scaffolding were hung from the roof and automatically rose with it. These provided something rather new: a vertical assembly line. At the top level, the crews tack welded the 3/16-in. shell plates in place. Second-level weldors finished the job with plug and fillet welding, while those on the third and lowest level made soapsuds tests of completed welds. One of the two 150-hp blowers used to boost the piston-roof unit ran at reduced capacity between lifts to provide air pressure for the bubble tests.

The continuous fillet welds were made with one pass. Plug welds were 11/16 in. in diameter and spaced at 6-in. centers. Also helping to secure the structure were 11/16-in. erection bolt holes on 3-ft centers; these holes were filled with rods held in place with ⅛-in. thick back-up discs.

A total of 56 welding machines were spotted around the roof's edge to power electrode holders on the scaffolding below.

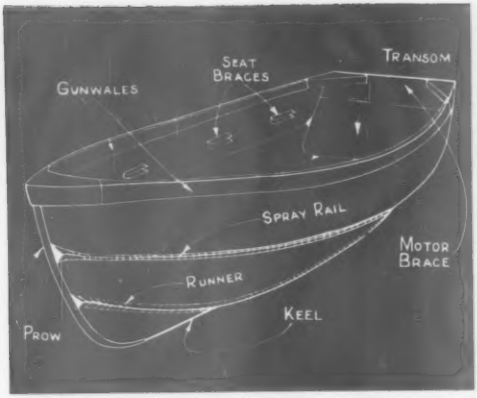
Individual welding stalls were built to test weldors' skill in the different techniques that were needed in the construction of the gas holder. There was no training program—weldors who couldn't do the work weren't hired. About 100 weldors were tested during the job, and about 75 passed the tests and worked at various times during the course of construction. The maximum number of weldors working at any one time was 54. It took 6½ months to build the holder from first weld to last weld, not including foundation and finishing work.

About 8,500,000 lb of steel were used in construction of the holder and about 50,000 lb of electrodes. The latter figure breaks down into about 26,000 lb of 3/16-in. E-6013 electrodes; 18,000 lb of 3/16-in. E-6011 electrodes; 2,500 lb of 5/32-in. E-6011 electrodes; 2,000 lb of ¼-in. E-6013 electrodes and about 1,500 lb of ⅛-in. E-6013 electrodes.



WELDORS' SKILLS were tested on the job in stalls like this

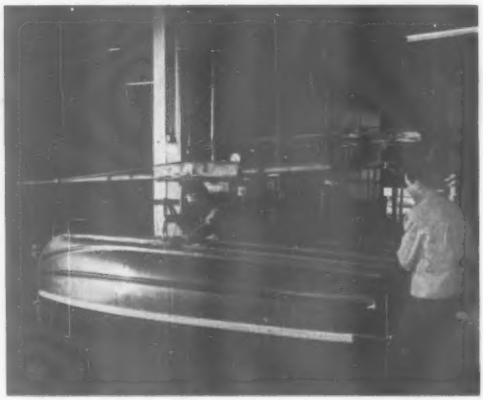
COMPLETED, big 28-sided tower is 254 ft in diameter, 385 ft high and holds 17,000,000 cu ft of gas



SKELETON VIEW of welded Monel rowboat identifies the various parts. Gunwales and motor brace are wood

SPOT WELDING the lockseam joint forming the keel. The spray rails and runners were previously pressed in

WATERTIGHT joint of prow and keel was made with a continuous seam weld after spot welding them together



STRENGTHENING lap joint between bow and stern. A chain hoist suspends adjustable positioning fixture

FILLER METAL added by inert-arc welding seals the bow-stern lap joint to make it completely watertight

PROW and its reinforcing Monel bars are inert-arc welded for watertight seal. No filler metal is added

IN THE WATER, "Seamaid" is easily handled by even a one-boy crew. Boat is safe and highly maneuverable

SWAMPED but youthful boatman won't drown. Craft is kept afloat by flotation tanks filled with "styrofoam"

Monel Outboard for Salt Water

Not even ocean salt spray can tarnish this new all-weather Monel rowboat. Spot and seam welding are used for strength, inert-arc welding to make watertight seals.

BY HAROLD SCHROCK
Plant Manager, Seamaid Boats, Inc.

SEAMAID BOATS, INC., of Kendallville, Ind., found that stainless steel couldn't take the gaff well enough under salt spray seawater service so the hulls of Seamaid outboard rowboats are now of Monel metal. The company makes 12-ft and 14-ft boats. The smaller boat has a beam of 46 in. and weighs 135 lb. The larger model measures 49 in. across the beam and has a weight of 190 lb. Either size can be readily mounted in regulation carrying style on top of an automobile.

How They're Made

The Seamaid hull is made in two sections—bow and stern. These are rolled from 12 and 14 gage Monel sheet, cold rolled ¼ hard. Handling Monel presents no difficulty; it is as readily formed as mild steel.

The bow and stern sections are sheared from Monel sheet of the nearest available size and are rolled to the proper shape and curvature. Spray rails and runners are pressed in, the transom is welded in at the stern and the lockseam joint of the keel is spot welded. The locations of these various parts are shown by the sketch at top of page 28.

Subassemblies of bow and stern sections are joined forward of center at a transverse lap joint by spot welding in a staggered row of spots, slightly out of line. This alternating row gives the effect of a double row. The whole assembly is then seam welded along the full length of the keel for watertightness, and the previously spot-welded transverse lap joint is sealed by inert-arc welding.

Wooden gunwales are riveted to the inside and outside of the top Monel edge. The outboard motor brace is similarly attached to the transom. Finally, Monel braces are spot welded to opposite sides of the inside walls for supporting the wooden seats, and metal cover plates are riveted fore and aft to the gunwales at the three corner joints.

The hull is tested for leaks in a water tank; then seats and hardware are installed. Attached to the underside of each seat is a removable styrofoam-packed flotation chamber, three for the 12-ft Seamaid and four for the 14 footer. These flotation tanks will keep the boat from sinking should it be accidentally swamped.

To strengthen the prow and keel, two strips of Monel bar stock ⅛ by 1 in. are spot welded, one on each side of the seam-welded joint, for the length of the prow. The edges resulting from this sandwich are sealed with a continuous edge weld by inert-arc welding. For the entire length of the bottom, a channel-like "cap" strip covers and is riveted to the keel.

Welding Details

Spot welding, seam welding and inert-gas metal-arc welding are used, the last-named process to finish seams and joints to assure watertightness. It is interesting to note that all three processes are used to form the prow.

The inert-arc torch has a ceramic nozzle and a 0.040-in. tungsten electrode. Argon consumption is approximately 20 cfh and current 15-20 amp, d-c, straight polarity. Filler metal is used only on the bow-stern joint, previously referred to. The filler rod is a 1/16-in. Monel rod specially prepared for inert-arc welding.

Wherever possible inert-arc welding is in the downhand position. However, overhead welding has to be done on the transom.

"Swabbing the decks" of these sturdy, shock-resistant, rustproof boats should be no trouble at all to those outboard enthusiasts who take to the salty seas.

How Northrop Aircraft, Inc.

Standardizes Its

LANDING-GEAR component is typical of the parts joined by flash welding at Northrop Aircraft plant at Hawthorne

Flash Welding

mens for visual defects, alignment and concentricity.

It is the further duty of the inspection department to hold up flash-weld assemblies until the Test Report (Fig. 2) for the assemblies has been received from Process Engineering.

The maintenance department must break and clean all secondary electrical connections whenever necessary.

Duties of Process Engineering

It is the function of the process engineering department to supervise and approve the qualifications and certification of all flash welders. Information for machining of test specimens is to be furnished when required.

Process Engineering shall test all specimens for qualifications, certification and production testing control. One copy of the Test Report (Fig. 2) is to be sent to the salvage engineer, one to Production Inspection and one each to Material Review, Precision Inspection and to the flash-weld production department.

Graphs of control settings are plotted by Process Engineering, which also has the responsibility for making the necessary contacts with authorized government inspectors.

Machine Certification

Flash-welding machines are to be certified for each type of part and cross-section that is to be flash welded. The procedure for certification is broken down into four basic steps:

(A) Welding of certification test specimens.

(B) Recording of machine settings.

(C) Tests of certification specimens.

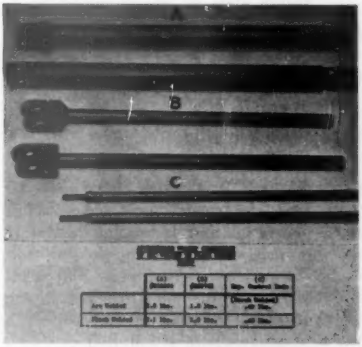
(D) Approval of machine settings.

Welding instructions are simple: After the machine settings have been established, weld a set of test coupons using the same settings throughout the run. Ten test specimens shall be welded for all combinations. Outside flash is to be removed to 0.01 to 0.03 in. above the surface.

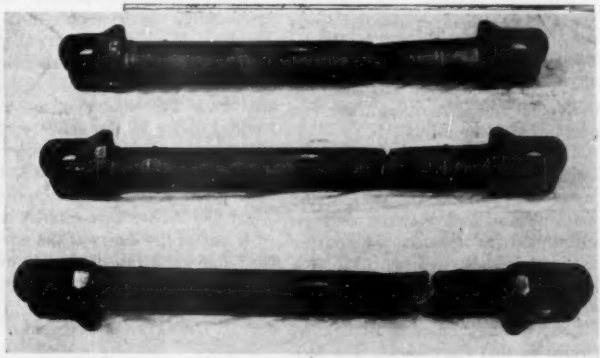
Recording of machine settings is done on the Operation Card (Fig. 1). All details of machine settings used for the welding of test specimens must be recorded.

The laboratory tests to certify test specimens provide that all specimens be tested in tension in accordance with Specification QQ-M-151. Five main points are covered under this heading:

(*a*) Prior to testing, all test speci-



HOW flash welding saves weight. Table gives weight advantages of three parts



PRODUCTION SAMPLES of flash-welded aircraft spars were tested to fracture. In all three cases, failure occurred outside the weld

mens shall be heat treated to a tensile strength of 160,000-180,000 psi, or to the final heat-treated condition of the production part as specified on the blueprint, whichever is higher.

(*b*) For joints tested as whole specimens, three of the test specimens shall be notched at the weld line.

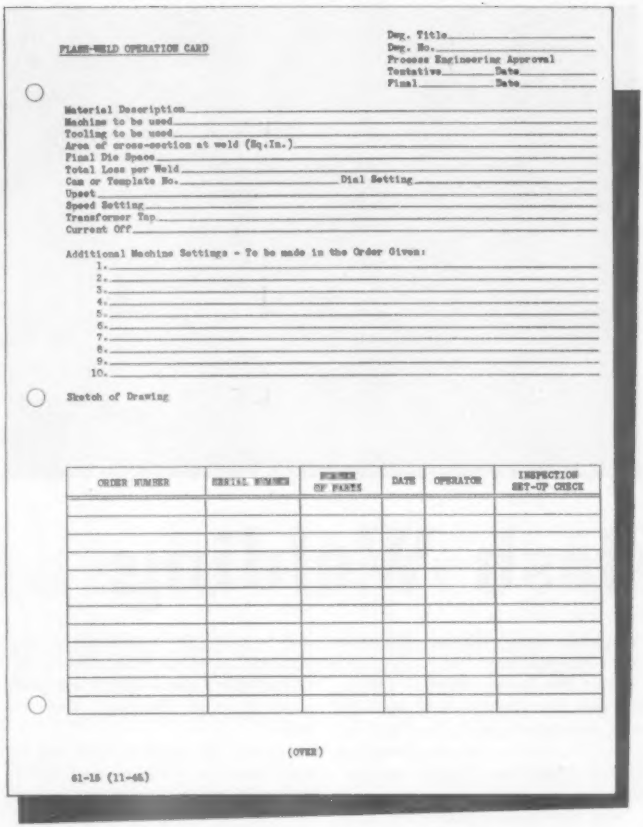
(*c*) No specimen tested as a whole specimen can be passed if it fails in the weld. Partial weld-plane failure in heat-treated whole specimens is not considered a weld failure where fracture in the weld plane does not exceed 25% of the weld area and is accompanied by visual necking down of the parent metal.

(*d*) If test specimens cannot be tested as whole specimens, the entire joint shall be cut into strip test coupons as per instruction of Process Engineering. The average strength of all coupons from each specimen shall not be less than the minimum psi of the parent-metal strength of the production part.

(*e*) For test specimens made from rod greater than 0.625-in. diameter, and for sheet or plate, contact Process Engineering.

For metallographic examination, the standards provide that the machine settings shall be free from cracks, porosity and oxide inclusions. If the notched specimens do not fail in the weld plane in spite of the heat treatment and notching, the weld shall be considered as sound.

Approval of machine settings is made by the issuance of an Operation Card (Fig. 1) for each drawing. Such a card is issued only if all test results satisfy requirements.



FLASH-WELD OPERATION CARD

Dwg. Title_____
Dwg. No._____
Process Engineering Approval
Tentative_____ Date_____
Final_____ Date_____

Material Description_____
Machine to be used_____
Tooling to be used_____
Area of cross-section at weld (Sq.In.)_____
Final Die Space_____
Total Loss per Weld_____
Cam or Template No._____ Dial Setting_____
Upset_____
Speed Setting_____
Transformer Tap_____
Current Off_____

Additional Machine Settings - To be made in the Order Given:

1._____
2._____
3._____
4._____
5._____
6._____
7._____
8._____
9._____
10._____

Sketch of Drawing

ORDER NUMBER	SERIAL NUMBER	NUMBER OF PARTS	DATE	OPERATOR	INSPECTION SET-UP CHECK

(OVER)

61-15 (11-46)

1—OPERATION CARD records machine settings for welding as approved from test specimens. No deviations from card are permitted in production

Test Coupons

Wherever possible, test coupons are to be welded to serve as test specimens. Coupons are defined and described as follows:

(1) The minimum length of the individual tubes, bars, etc., for test coupons shall be 6 in.

(2) Test coupons shall be of the same type and cross-section as the production parts in the area of the weld. Normalized material may be substituted for annealed material or for material heat treated to 125,000-145,000 psi tensile strength, in the making of test coupons.

(3) Welding edges must be machined so that the chamfer and face angle are exactly the same as those of the production part.

(4) Test coupons shall be cleaned in the same manner as production parts.

Other standards pertain to the preparation of materials for flash welding. It is provided that all paint, plating and oxide scale shall be removed for a minimum of at least 3 in. from the ends that are to be welded, prior to the delivery of the detail parts to the flash welder. The cleaned area shall be rinsed, dried and given a coat of rust-preventive light oil. As we have already noted, it is one of the duties of the operator to remove the rust-preventive oil before flash welding begins.

Operating Standards

Standards for the operation of flash welders pertain to (A) machine set-up; (B) check for each machine set-up; (C) production testing.

Machine set-up: Flash-welding machines must be set up according to the machine settings that are given on the Operation Card (Fig. 1). No deviation is permitted from the approved machine settings.

All die contact areas are to be cleaned before parts are inserted into the machine.

Check of set-up: A check of all details of the first three test coupons and of the first flash-welded assembly must be made before proceeding with the production welding. Full compliance to the blueprint and to the standards detailed in the company's printed bulletin is required.

In addition, three specimens must be welded and checked visually for:

NORTHROP AIRCRAFT, INC.

PROCESS ENGINEERING

LAB. NO.

DATE

P.E.T.

FLASH-WELD TEST REPORT

DWG. TITLE

DWG. NO. STD. DWG. SHEET ASSEM. NO.

MATERIAL DESCRIPTION

HEAT TREATED AS WELDED ☐

HEAT CHART NO.

SERIAL NO.

NO. OF PARTS

MODEL NO.

SPECIMEN	WELD NUMBER	DIAMETER	THICK	AREA	LOAD	PSI	FAILURE

SATISFACTORY ☐ UNSATISFACTORY ☐

2—TEST REPORT is issued by Process Engineering when weld specimen qualifies. Machine settings used are then approved for an operation card

angularity of the welding, telescoping and general appearance.

Alignment of the welded parts must be measured.

Whenever surface burning or pick-up occurs, dies must be cleaned or replaced. Dies must also be replaced whenever the die dimensions change. The material used for flash-welding dies is specified as RWMA Class 2, Group A (copper-base alloy).

Production testing: Operator must weld one test specimen or one production part for testing after 50 production flash welds or after each production lot if the lot quantity is less than 50.

The first three set-up test specimens and those made during the production run shall be tested in the same as the final heat-treated condition of the production parts.

Flash shall be removed as specified on the drawing.

All test specimens shall be routed to Process Engineering and tensile tested in accordance with Spec. QQ-M-151.

A flash-weld Test Report (Fig. 2) shall be issued for each production run and shall be marked as satisfactory provided that the test results are in accordance with the specified requirements.

Inspection Procedure

All flash-welded assemblies shall be inspected for full compliance to drawing and bulletin requirements and shall be magnetic-particle inspected in accordance with the requirements of Spec. AN-I-32. This brings up the question of major defects.

Major defects are listed as cracks or telescoped welds. If any of these occur on any flash-welded joint, the assembly must be rejected for salvage.

The angular misalignment of the welded joints shall not exceed 0.010 in. per inch of length up to a maximum of 0.030 in. total run-out.

Alignment tolerance for sheet and tubular joints depends upon thickness. For sheet or wall thicknesses of 0.080 in. or less, the misalignment of thickness shall not exceed 0.008 in. For sheet thickness or tubing wall greater than 0.080 in., the misalignment of the thickness shall not exceed 10% of the nominal section thickness up to a maximum of 0.030 in. Misalignment shall be measured at or near the plane of the weld before the flash is removed.

In flash-welded joints between bars, the misalignment of the surface shall not exceed 5% of the diameter or thickness of the bar when measured at or near the plane of the weld before the flash is removed.

When proof loading is used to test joints, the proof load shall be as specified on the drawing.

Questionable Conditions

Questionable weld conditions are listed as: (1) indications found during magnetic-particle inspection; (2) die burns; (3) non-symmetrical weld geometry. When any of these occur, it is necessary to contact Process Engineering for further testing and/or a written report.

Production parts shall not be released for stocking or for production use until the testing has been completed and approved in writing on the Test Report form (Fig. 2).

Provisions under the reworking of flash-welded assemblies cover straightening and rewelding. All flash-welded assemblies are required to be routed for checking the straightness and straightening if necessary. The minimum distance between the weld and the point of pressure application for straightening may not be less than one-half of the diameter or thickness of the flash-welded section.

In rewelding assemblies, all blueprint and bulletin requirements must be followed. Component segments that are to be rewelded shall be so identified that mating parts can easily be assembled after the rewelding.

IF OPTIMUM GRINDING performance and lowest grinding cost are obtained, he'll have to specify the right combination of components

How Can I

Do I select the type of wheel before I determine grinding grade, or is it the other way 'round? Maybe I should pick a harder grinding grade, or is it a softer grade? Say, what's meant by grade, anyway—does it have anything to do with grit size or the kind of abrasive?

(Answers in the text)

BY H. W. WAGNER AND E. T. LARSON
Norton Co., Worcester, Mass.

MANY users can testify that the grinding wheel is not exactly the easiest cutting tool to specify. Metal tools like tool bits, milling cutters, drills and taps can be specified simply by size or catalog number. But a grinding wheel is made up of a number of components: abrasive, grit size, grade (strength of bonding), structure number and kind of bond. All of these must be in the right combination to fit the conditions and requirements of each grinding operation if optimum grinding performance and lowest grinding cost are to be realized.

Performance and Grade

The most accurate and complete evaluation of grinding performance is by comparison of total grinding costs per unit of work produced. The two universally important characteristics are:

(*a*) Wheel life in terms of units of work ground.
(*b*) Freeness of cut.

For many operations, there is a third characteristic—finish on work. Other features of performance are functions of (*a*) and (*b*).

"Grinding grade" is described as a wheel's resistance to wear under a given grinding pressure. The general effects of going to a softer grade are:

1. Freeness of cut will improve.
2. Rate of cut will increase under equal grinding pressure because of (1).
3. Wheel life will be shorter.
4. Clean-up of feed (sparking out) will be more rapid in precision or fixed-feed grinding because of (1).
5. Less power will be drawn by the wheel, and there will be less danger of cracking, burning or softening the work, in fixed-feed grinding, because of (1).
6. If the starting grade was too hard, accuracy of work and pieces per truing will be improved in fixed-feed grinding. This is not true if the starting grade was just right; then by going still softer, the accuracy and number of pieces per dressing will be affected adversely.

It should be pointed out that a wheel that is too hard can have a short life because of rapid dulling. This leads to wastage of abrasive as more frequent truing and dressing are required. Sometimes wheels have been reported "too soft" when, actually, they were too hard.

When a fine finish on the work is required, it is usually necessary to use a wheel having less than the maximum freeness of cut. If loading is a problem, as it is when ductile, nonferrous metals are ground, relatively rapid wear and consequent short wheel life may be unavoidable because of frequent dressing.

Up to this point, we have discussed only the effects of grinding grade. When no other component of a wheel is changed, the grinding grade varies in the same direction as the assigned grade letters.

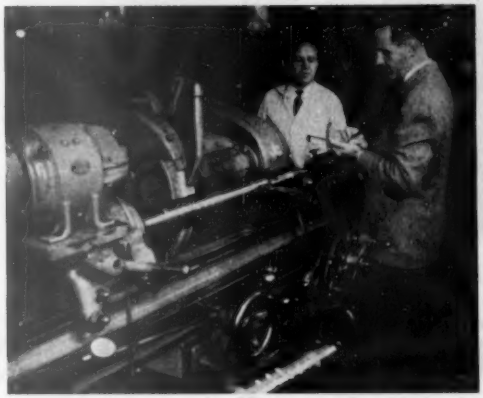
In either a fixed-feed or a precision grinding operation, relative rate of wheel wear is determined by grinding grade and whatever work pressure is built up in grinding.

Grinding Wheel Components

In addition to the effects of grinding grade, the kind of abrasive, grit size, kind of bond and sometimes structure number and filling treatment are of prime importance. A change in any one of these components may lead to an improvement in wheel life or in freeness of cut without detriment to the other.

To clarify our reasoning, let us think of the wheel's make-up as being divided into two parts: grinding quality and grinding grade. Grinding quality is dependent upon the com-

Tell Which Wheel to Use?



IN PRECISION grinding, most economical wheel is the one that turns out good work at the highest rate

IN SNAGGING, the wheels should be evaluated on the basis of the total grinding cost per unit of product

bined effect of components other than grade. Grinding quality really is a matter of fitness of the type (kind of abrasive, bond, etc.) of wheel to the specific job. Grinding grade is related to grade letter or strength of bonding.

The proper procedure is to select the most suitable type (abrasive, grit size and bond) of wheel first. Then select the grinding grade that will give the most economical performance with reference to wheel life, freeness of cut and finish.

Grinding Cost Calculations

It is common practice to compare snagging wheels on the basis of calculated total grinding cost per unit of work such as pounds of material removed or tons of work handled.

In laboratory tests of snagging wheels, the object usually is to compare types of wheels for grinding quality rather than to select a suitable grinding grade. For this purpose, the value M^2/W has been arbitrarily selected as being proportional to quality in constant pressure swing frame grinding. "M" is the rate of production in any convenient unit, such as pounds of work removed per hour. "W" is rate of wheel wear by volume, such as cubic inches per hour. An equivalent expression is $M^2 \times L$, in which "L" is wheel life in hours. For other constant-pressure grinding operations, the exponent of "M" is likely to be different from 2. In portable snagging, for example, the exponent is greater than 2.

The quality value, M^2/W, is approximately proportional to the relative money value of the type of wheel. The most economical specification, then, will be the highest quality type and optimum grade. "Optimum grade" is the one that results in a proper ratio of wheel to time cost and therefore yields the lowest total grinding cost per unit of work. In swing frame grinding, it has been proved that optimum grade is reached when wheel cost and time cost are about equal. Time cost is the sum of labor and overhead costs. The total cost rises slowly with grades either harder or softer than the established optimum.

When the optimum grade of each type of wheel is employed, the money value of each wheel is approximately proportional to the grinding quality. In other words, if the user paid for the wheels in proportion to the grinding quality, his total grinding cost would be about the same with each wheel.

Summary

Desired elements of grinding wheel performance are:

Long wheel life,
Freeness of cut,
Fine finish (for many operations).

"Grinding quality" of the type of wheel depends upon fitness of abrasive, bond, etc., to the job.

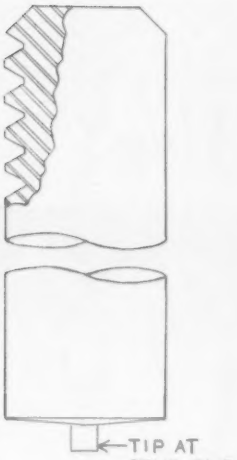
After the most suitable type of wheel has been determined, optimum grade of that type must be selected to yield maximum economy.

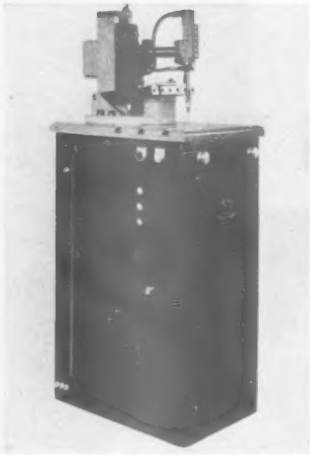
In precision grinding, the specification that permits the highest rate of production of satisfactory work is the most economical.

In snagging, total grinding cost per unit of product affords the most significant evaluation of wheel performance.

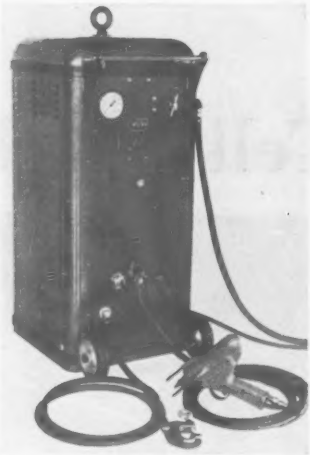
In swing frame grinding, the optimum grade of wheel is that which leads to approximately equal wheel and time costs per hour or per unit of work.

Photos courtesy of *Grits and Grinds.*





CABINET



PORTABLE

Capacitor-Operated

When stud first touches workpiece, condenser discharge is concentrated in a tiny tip (see the sketch). Tip vaporizes, creating an ionized path for the current.

A CAPACITOR-OPERATED stud-welding unit has been developed by the Graham Mfg. Corp., Ferndale, Mich., to permit high-production welding operations. This equipment will weld studs to very thin plated or painted metals and can be used to weld dissimilar metals in combinations. The welders are available in cabinet models and as portable gun-welding units. No timing devices or auxiliary cooling means are required.

No Flux Needed

Neither the stud nor the metal plate needs any flux or special preparation. All low-carbon steel and most non-ferrous metals except lead can be stud-welded satisfactorily. Steels of high-sulphur content or, occasionally, of high-carbon content may be difficult to handle by this process.

Operating principle of the Graham process may be explained by tracing the electrons through the welding circuit. First, the condensers are charged to their capacity by taking electrons from the positive plates and adding them to the negative plates. The electrons are then conducted to the welding gun, the collet and the stud. As the electrons enter the stud, it is traveling toward the workpiece at a predetermined velocity. A tiny tip on the stud (see sketch) is the first to approach and contact the workpiece. Thus the discharge is initially concentrated over the very small area of the tip. This high flow and overcrowding of electrons in the tip causes it to heat and vaporize. Combination of the heat and the vaporized metal creates an ionized path between the workpiece and the main body of the stud. The major part of the electron flow then forms an arc between the stud and the plate.

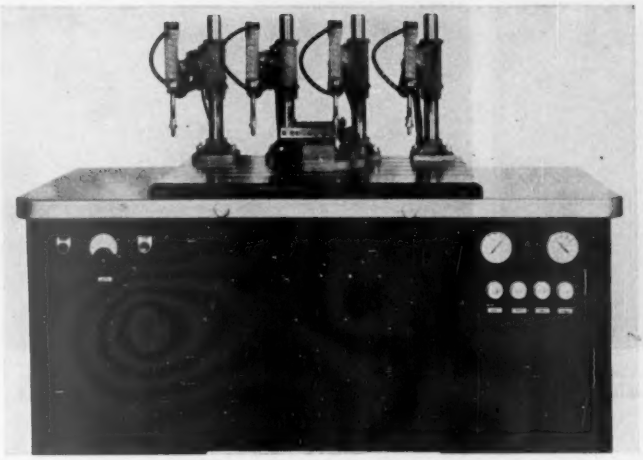
Face of the stud becomes molten and so does a similar area on the workpiece. At this exact instant, the stud hits the melted area of the plate at a velocity of about 31 inches per second. Result is the two parts are welded together. The hammer blow is provided by the inertia of the moving piston, piston rod and collet assembly. The entire cycle requires only one mil-second.

Studs of various sizes (3/32 to ½ in. in diameter) can be welded to thin sheet stock or to heavy sections with strength equal to or greater than the parent metals. Such combinations have been welded as steel to steel, steel to brass, steel to stainless steel, aluminum to zinc die-cast, aluminum to aluminum, copper to steel, aluminum to copper, brass to zinc die-cast and to other metals.

Power consumption in the largest of the Graham machines is less than two kva, and so little heat is generated that the work is not distorted nor annealed. There is no marring of thin sections, which may be plated, painted or enameled on the face of the workpiece. Since the time of the arc is short, studs are welded with little or no fillet.

Cabinet models for factory production provide a worktable for mounting and clamping the work in position. There may be one or more welding guns. A post clamped to the table supports the welding gun or separate posts support each gun. The gun is constructed with a piston and piston rod extending downward out of the gun body, and a collet for holding the studs is fastened to the end of the piston rod. Air pressure on the piston moves the stud to the workpiece.

After welding a stud, the piston and collet assembly returns to the up



4-GUN CABINET MODEL

Stud Welders

position by "restore" air pressure on the rod side of the piston. The restore air pressure is constant all the time the machine is in operation, but the air for moving the stud downward has to be turned on. Control of the speed of stud travel is managed by changing the pressure on the piston or the restore air side.

Condensers Store Current

Condensers for storing the welding current are mounted inside the cabinet on both the stationary and the portable models. Normally, two condensers are used per welding gun, but this varies with the type of metal, thickness, etc. All models, exclusive of the portable type, are equipped with built-in generators for charging the condensers. Charging time with a motor-generator is between 0.4 and 0.8 seconds. The portable model is equipped with a selenium-type rectifier to furnish direct current for charging.

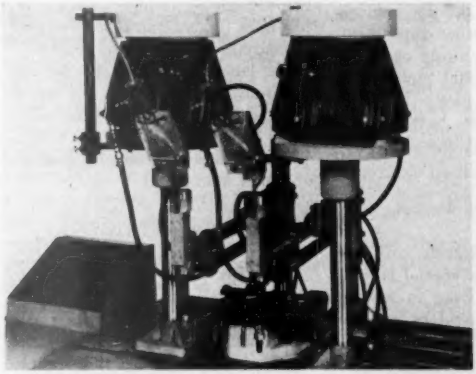
Control of the current discharge is made by an electrically or pneumatically operated contactor that interrupts the charging circuit and then makes the welding circuit. The contactor is actuated initially by push-buttons on the front of the cabinet. The buttons also control the air on the welding gun so that the piston moves downward at the desired speed when the electrical circuit is complete.

The voltage required can be 110, 220 or 440 volts. Normally, air pressure must be between 85 to 100 psi. The largest cabinet model requires a floor space of 3 by 6 ft. The portable model takes up only 20 by 20 in.

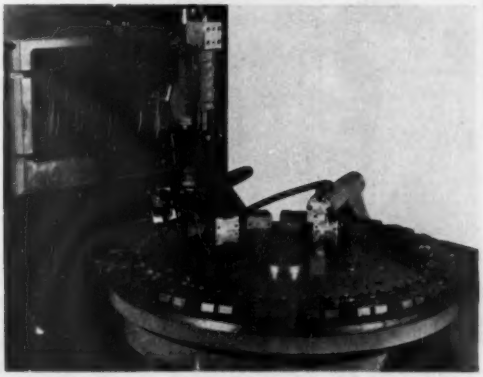
Automatic stud selection and feeding devices have been developed to speed stud welding in assembly-line operations. Indexing fixtures are also available. With such mechanical aids, production records of more than 3,000 studs per hour per operator have been achieved. Stud locations are maintained as close as 0.001 to 0.003 in.

Portable Welding Gun

The newest Graham development is the portable model, which has a wide range of application in shipbuilding, airplane and auto manufacture, building construction, repair shops or anywhere that stud welding must be done in otherwise inaccessible places. All controls are wholly self-contained on the mobile cabinet. Operation has been reduced to simplest terms: the operator merely sets the air pressure control and adds—or subtracts—condenser capacity. Once the controls are set for a job, the gun operates independently. An indefinite number of studs can be welded so long as the stud size and the parent metal remain the same.



AUTOMATIC FEEDING: Hoppers "march" studs to feed lines, where they are synchronized with gun movement



INDEXING: On high-production jobs, this index table expedites a continuous flow of workpieces to the gun

1—SUPERVISOR William C. Lilly questions applicant about previous experience before scheduling the test

2—NINE MAKES of welding torches allow the weldor his choice. He doesn't have to use an unfamiliar tool

5—CHEERFUL layout helps welding. Each booth is well lighted and has all equipment a weldor needs

6—JIG FOR guided bend tests is homemade. Supervisor Lilly pumps the hydraulic jack to bend coupon

They've Got to

Eight coupons are cut from a pipe section and bend tested at the Chicago laboratory of the National Certified Pipe Welding Bureau in order to qualify weldors.

BY WILLIAM C. HENZLIK

HOW DOES a piping contractor know a new weldor will be able to weld just about any pipe on the entire job? He doesn't, you say? Not until the weldor actually welds a joint? Brother, that was yesterday! Nowadays certified pipe weldors can weld piping as it should be welded, and the boss knows it's good before he tests it.

Certification of weldors has been carried out increasingly the last several years through the good efforts of the National Certified Pipe Welding Bureau, a nationwide organization of more than 200 piping contractors. To give an idea of how they work, let's look at the bureau's Chicago chapter, one of its most active and important.

A Lab for Pipe Weldors

The Chicago branch of the NCPWB maintains a special laboratory at 1444 West Lake St., where journeyman pipe weldors in the Chicago area are certified. This laboratory has tested more than 600 men in the last 1½ years. Its supervisor is William C. Lilly, a veteran of 15 years of welding. The Chicago laboratory is the only one in the country working exclusively for the bureau. Other chapters of the bureau use trade schools or privately operated laboratories under the supervision of the National Board of Boiler and Pressure Vessel Inspectors.

Men certified have welded such jobs as the 1,050 F, 1,800 psi piping recently installed in a Chicago electrical generating station. (See page 34, THE WELDING ENGINEER, December, 1950.) Some pipe walls on this job were 3⅛ in. thick and required as many as 225 passes per joint.

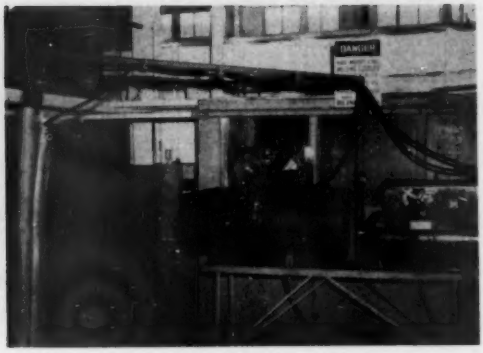
The laboratory is run only for certification tests. It does not try to teach applicants to weld (they're already journeymen) but only how to avoid mistakes that hinder deposition of sound weld metal.

Little Things that Count

Bill Lilly is at the laboratory to help weldors to pass their tests, and he tries to anticipate anything that might bother them during testing. He has found several things that seem to put weldors at ease.

First, he wears work clothes to the

3—TEST WELD with oxyacetylene torch. A positioner of welded pipe holds work for the required positions



4—OVERHEAD CABLES, welding and ground, reduce cable wear and strain on connections. It's safer, too

Be *GOOD!*

laboratory. It reassures weldors if they see that a welding man is going to supervise the tests—a man slicked up in a white shirt and tie might give the whole thing an official and formal atmosphere.

Technical terms about metallurgy and chemistry are strictly out during the few minutes the applicant first meets Lilly (Fig. 1). He uses work-a-day language gained in 15 years of welding in industry, Navy shipyards and construction outfits. Weldors like his "easy-to-know" attitude.

An applicant's immediate welding background has bearing on his tests. If he hasn't welded pipe for six months, it is only fair to let him practice on some scrap sections before testing him. Sometimes it's a good idea to send the applicant home for more extensive practice. But a weldor with no pipe-welding experience at all is immediately disqualified. He would only waste everybody's time.

Nine standard makes of welding torches are kept on hand at the laboratory (Fig. 2). This allows the applicant to run his test with the same make of equipment he uses in his everyday work. There are no misgivings in his mind caused by trying to accustom himself to a strange torch. For arc weldors, several types of motor-driven welders are available.

Since some weldors don't understand the purpose of the tests nor how testing should be carried out, Lilly can again offer help. The standard procedure specifications under which the weldor will be qualified are explained and, if necessary, demonstrated to the applicant.

One of the best things a supervisor can do on test work is to leave the weldor alone. This Lilly does after he gets the man started on his test sections. The absence of critical glances at his weld makes a man more confident.

Good Working Place

Each of the four welding booths has a large homemade positioner that serves efficiently to hold pipe sections in either horizontal or vertical position (Fig. 3). The positioner, naturally, is made of welded pipe, too.

Of the four roomy booths for welding, two are supposed to be for arc welding and two for oxyacetylene welding. Actually, all four can be used either for arc or gas welding. Extra cable lengths and portable cylinder trucks are available to make the switch.

Cables from the two mounted welders are carried overhead on a unique frame (Fig. 4). Wear on the cable or possible strain on connections are largely eliminated by mounting them in this way.

Big windows on the west side of the laboratory give natural light to all four booths (Fig. 5). On dark days, overhead fluorescent lamps give light to the whole building. A light gray paint is the most prevalent color in the room. The entire laboratory leaves a clean and cheerful impression, helpful to good welding.

Walls of the booths are movable to let more equipment be brought in or a double booth created. Material in the booths is 1½-in. and 2-in. pipe welded to stationary uprights at each corner. Projecting ends of 1½-in. pipe members are loose fitted into holes or open sections of 2-in. pipe to provide movable joints. Heavy canvas stretched across rectangular panel sections protects the shop from flying sparks.

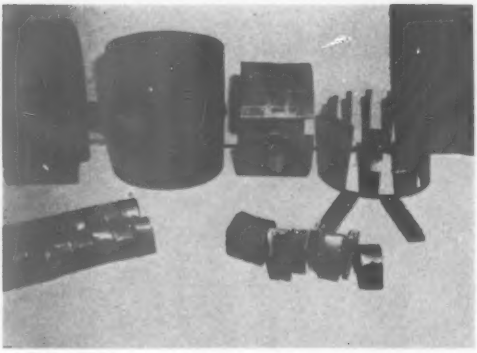
Other equipment includes portable grinders, chipping hammers, cleaning brushes, portable drills, bench grinders and tip-cleaning equipment. Several large metal tables and a workbench provide room for demonstrations and working space.

For casual observers dropping into the laboratory, a railed second-story balcony overlooks the booths and shop area. Visitors are encouraged to use the balcony, both to prevent disturbance to the weldors and to protect themselves from sparks or other debris.

Weldors are tested on pipe of 10-in. diameter, 0.365-in. wall thickness, ASTM designation A43 or A106 grade A seamless steel pipe. The welding groove has a 35-deg bevel and 1/16-in. land. A root opening of ⅛ in. is specified.

The supervisor makes one exception to his rule of leaving the weldor alone: he inspects the weldor's root pass. Should it be unsatisfactory,

7—FILING CABINET holds tack-welded coupons that passed tests. Coupons are kept for three-year period



8—STAGES in testing: before welding, as-welded, coupons cut out, coupons bent and tack welded for file

the test is stopped immediately. The weldor then receives a small test piece of steel to try again. He must show correct procedure in laying the first pass. If he fails again, in the judgment of the supervisor, he is dismissed.

Most Failures on Root Bends

Reason for inspection of the root pass lies in the Bureau's observation that most failures occur on root bend specimens. These are specimens bent so that the first weld bead is on the outside and receives the most strain. Face bend specimens are more likely to pass since the final beads only have to have good fusion with each other.

A slight build-up or bead inside the pipe is usually recommended by the test supervisor. It is obtained by melting a hole in the edges of the pipes ahead of the weld and allowing the molten metal to flow back into the bead. The usual hole recommended is about 3/16 in. in diameter.

Arc-welded specimens sometimes reveal depressions on the inside bead at the point where new electrodes are started. Experience has shown that the 3/16-in. hole should be enlarged to a ¼-in. hole. The electrode is then inserted through the hole so that the arc is placed on the inside of the pipe. As the electrode is stuck through the hole, it is inclined at 45 deg to the plate or pipe and points backward toward the preceding bead. The electrode quickly burns off, and normal welding is resumed with the arc on the outside of the pipe.

After the two pipe sections have been welded into one, the excess weld metal is machined off flush with the outside surface of the pipe. A shop grinder is available for finishing such welds, but machining is quicker and cheaper.

Coupons are cut from welded and machined pipe sections. This is done with a small cutting torch. A simple template oriented with the bottom of the pipe insures that all coupons will be taken from identical positions in every man's test. Rough flame-cut edges on the specimens are smoothed off at the shop grinder.

All coupons are bend tested on the standard guided jig recommended by the American Society of Mechanical Engineers and the American Welding Society. A simple but efficient bend tester was made from a hydraulic cylinder and pump, steel bar stock and scrap plate sections (Fig. 6). The test coupon rests on two case-hardened rollers at the top of the female die. As the male die forces the coupon into the female die, the rollers rotate to allow a smooth guided bend.

All Eight Must Pass

If all eight coupons from a section pass the bend test, the weld is held acceptable. If one or two fail, the weldor is told the reasons or possible causes. If otherwise good welding is apparent, the weldor is scheduled for a retest. Should a majority of the coupons at the second test show inferior welding, the weldor is sent back for additional practice.

All eight specimens are tack welded together and marked with the weldor's initials. This concrete evidence of a weldor's skill is kept for three years in a "filing cabinet" (Fig. 7). If any question should arise about a job and the fitness of the weldor doing it, it's easy to refer to his test coupons. Coupons are kept only three years since that is the period for which each certification holds.

Fig. 8 shows the various stages of testing. At top left are sections before welding, next to them welded sections. On the right, coupons have been cut from the welded sections and in the foreground the coupons have undergone their bend test. The eight tack-welded specimens kept on file are in the left foreground.

Certified Weldors Listed

The names of weldors passing the tests are entered on lists of certified weldors that are circulated to every chapter of the Bureau. It isn't necessary for the weldor to carry any certification of his skill since these lists are so easily available to both union and contracting officials.

Qualifying of pipe weldors in the Chicago area has had many favorable results. Most pipe welding being done in the city today is good—good because done by men who are confident of their skill and of their demonstrable worth to their employers. Undoubtedly, such qualification has meant more steady employment to many weldors who have this means of proving their proficiency.

More and more welded piping is being used by industry. More and more calls will come in the future for skilled weldors of the caliber that Chicago's welding laboratory has been certifying.

OAKLAND municipal auditorium, where technical sessions will be held, is at left; exposition building on the right

Western Metal Show

BY CLYDE B. CLASON

ATTENTION of the western welding world is focused on Oakland, where, just across the Bay from San Francisco, the seventh bi-annual Western Metal Congress & Exposition will be staged. This year's congress will be held from March 19 through March 23 at the Oakland civic auditorium under sponsorship of the American Society for Metals and 20 other co-operating technical societies including the American Welding Society.

Some 25,000 persons interested in one phase or another of the metal-working industries are expected to attend.

"Production for America" is the timely theme of the congress. Speakers will emphasize means of speeding up production so as to reach our goals in a minimum time and at a reasonable cost.

Two series of meetings are scheduled: one by the American Society for Metals and one by the American Welding Society. Manufacturers will exhibit their latest products in the exposition building, next door to the municipal auditorium.

AWS Program

The American Welding Society is planning to hold nine technical sessions, from 10 a.m. to 12 and from 2 p.m. to 4 p.m., during the five days (except Friday afternoon). There will also be an official convention luncheon on Monday March 19.

Speakers for Monday morning are: L. C. Hollister, bridge engineer, California Division of Highways, on "Bridge Structural Welding" and La Motte Grover, welding engineer, Air Reduction Sales Co., on "Structural Welding."

On Monday afternoon, James P. Kemp, metallurgical engineer of the American Brass Co., will talk on recent developments in the brazing and welding of copper.

On Tuesday morning, W. A. Saylor, metallurgist, Consolidated Western Steel Corp., will discuss the welding of large-diameter, high-strength cold-worked pipe, including metallurgy and testing methods. T. I. Parker, superintendent of specialty manufacturing, Kaiser Steel Corp., will describe recent developments in flame-cutting.

Tuesday afternoon papers will be given by T. R. Brashear, superintendent of automatic welding, Leader Welding & Mfg. Co., on automatic hard-facing, and by F. R. Drayhos, metallurgist, Byron Jackson Co., on how shielded-arc and submerged-arc welding are being used by the centrifugal pump industry.

Inert-Gas Welding

Most of the Wednesday papers will be on some phase or another of the inert-arc welding process. In the morning, G. L. Richardson, manager product service, General Electric Co., will talk on the welding of jet component parts, while L. Robbins, welding engineer, Mare Island Naval Shipyard, will describe semiautomatic inert-gas metal-arc welding.

Wednesday afternoon, the fundamentals of inert-gas-shielded arc welding will be covered by H. E. Rockefeller, assistant manager of development and process service, Linde Air Products. Also on the program is J. H. Berryman, Air Reduction, whose subject has not yet been determined.

On Thursday morning, the movie "This Is Resistance Welding" will be shown through the courtesy of the General Electric Co. It will be followed by a talk on the quality control of structural resistance welding in aircraft, by J. R. Fullerton, welding engineer of Ryan Aircraft Co.

The subject of resistance welding is continued on Thursday afternoon with a paper by Charles Smith, engineer, Douglas Aircraft Co., on the flash welding of mild steel and high-strength alloys for high-speed production. Breaking away from aircraft, R. G. Reigel, superintendent of electric welded pipe, Kaiser Steel Corp., will discuss the "Kaiser Steel 14" electric weld process.

Educational Session

The Friday morning session, which differs from other morning sessions in beginning at 9 instead of 10 a.m., is largely educational in nature. T. B. Jefferson, editor of THE WELDING ENGINEER, will deliver a "progress report" on welding processes. Professor R. C. Wiley, of the welding department, California State Polytechnic College, will develop his paper around the tentative theme, "Should Welding Be on Its Own in Education?" The program will conclude with an hour of open discussion on the education of the welding engineer.

Many visitors who are primarily interested in welding will no doubt wish

REGO

HIGH PRESSURE
CYLINDER
VALVES

for OXYGEN and HYDROGEN

Designed, tested and proved for high pressures and severe service.

Packing may be replaced with cylinder under pressure if necessary.

Fuse plug and bursting disc provide positive safeguard.

Bronze stem furnished as standard, also available with monel stem on special order.

for ACETYLENE

Cadmium-plated steel stem with monel tip resists rust and wear.

Ball-nose seat construction assures positive shut-off.

for CARBON DIOXIDE

Available with diaphragm-type or packed-type construction.

Compact rugged design for use with high pressures.

Equipped with bursting disc safety device.

*Reg. U. S. Pat. Off.

The BASTIAN-BLESSING Co.
4201 West Peterson Ave. Chicago 30, Illinois

PIONEER AND LEADER IN THE DESIGN AND MANUFACTURE OF PRECISION EQUIPMENT FOR USING AND CONTROLLING HIGH PRESSURE GASES

to stagger their attendance so that they can take in a part, at least, of the interesting bill-of-fare being offered by the American Society for Metals. Like the AWS meetings, the ASM sessions will run morning and afternoon for the full five days of the Metal Congress except Friday afternoon.

ASM Program

Monday meetings will be devoted to the aircraft industry. "Experts" on the program are: Leo Schapiro, Douglas Aircraft Co., Inc.; Alfred H. Petersen, production design engineer, Lockheed Aircraft Corp.; T. E. Piper, chief materials and process engineer, Northrop Aircraft, Inc., and Arthur W. F. Green, chief metallurgist, Allison Division of General Motors.

Tuesday is reserved for a seminar on service failures. Roundtable discussions will be held on mechanical failures in the morning and corrosion failures in the afternoon. Speakers on mechanical failures are: Arthur E. Foeke, chief metallurgist, Diamond Chain Co., Indianapolis; J. B. Dotson, Nordstrom Valve Co.; Howard J. Stagg, Crucible Steel Co.; Arthur W. F. Green (who also has a paper on Monday) and Walter E. Jominy, staff engineer of Chrysler Corp.

Speakers on the roundtable discussion of corrosion failures are: James T. Weber, of the Los Alamos (N.M.) Scientific Laboratory; Sam L. Hoyt, Battelle Memorial Institute, and Roy Paine, Aluminum Co. of America.

Wednesday will be a panel discussion on the conservation and utilization of and substitution for strategic and scarce materials. Ferrous metals will be discussed in the morning and non-ferrous metals in the afternoon. Speakers had not been announced at the time of the present writing.

Thursday morning there will be a business forum, with speakers to talk on civilian production. The afternoon session will consider the metallurgical problems of the small manufacturer; speakers are Reno R. Cole, chief metallurgist, Friden Calculating Machine Co., and Walter E. Jominy (also on the Tuesday morning program).

Friday will be devoted to the metallurgical problems of the oil industry. Speakers are: E. V. King, Standard Oil Co. of California; George A. Nelson, Shell Development Co., and Ralph Wilson, director of research, Timken Roller Bearing Co.

JIM, HOW ARE WE GOING TO DO ALL THIS CUTTING AND WELDING...AND STILL MAKE DELIVERY ON TIME?
THAT NEW P&H ELECTRODE IS THE ANSWER, BILL. DH-4, THE FASTEST ROD WE'VE EVER BURNED!

NEW P&H DH-4 Electrode

3 Sizes Available
1/8", 5/32" and 3/16"
Operates off DC welder on straight polarity or AC welder with minimum open circuit voltage of 80 volts.

For high-speed welding — cutting and gouging

...perfect X-Ray welds on heavy metal sections without machining or scarfing

This is the most unusual rod ever developed. It has so many applications that the American Welding Society does not have an AWS number for it.

Because of its wide range of usefulness the new DH-4 rod has shown outstanding economies in welding time and costs.

Here are a few of its many advantages: Fast deposition rate. Easy manipulation. Welds mild steel to mild steel without processing. Has extremely high penetration — 1/4-inch with 1/8-inch rod at 300 amps. Cuts time on horizontal fillet welds, flat butt welds, and vertical down welds. Ideal for gouging and cutting. Gives excellent results on Hadfield manganese and high-carbon steels.

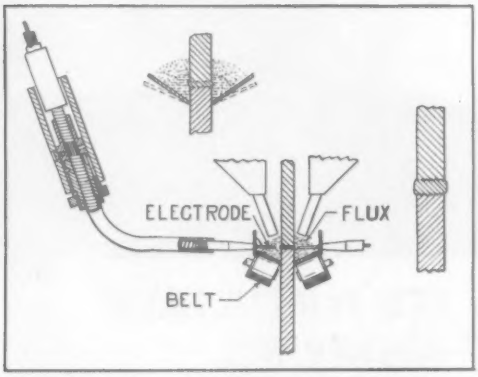
If you want to give your production a lift and reduce your costs, you'll want to know more about the unusual DH-4. See your P&H representative or distributor. Write us for details.

P&H HARNISCHFEGER CORPORATION

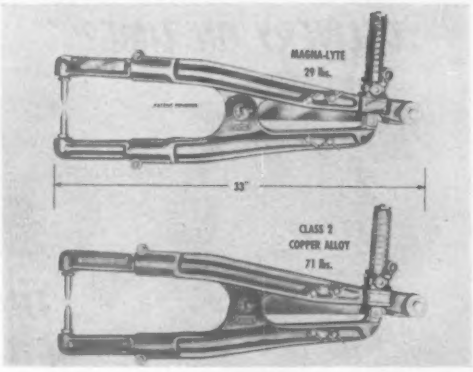
WELDING DIVISION
4513 W. National Ave.
Milwaukee 14, Wisconsin

Excavators • Overhead Cranes • Hoists • Arc Welders and Electrodes • Soil Stabilizer
Crawler and Truck Cranes • Diesel Engines • Cane Loaders • Pre-assembled Houses 2256

New products



SIDEWAYS submerged arc welding allows working from both sides. Special moving belt keeps flux around joint



GREAT WEIGHT saving afforded by "Magna-Lyte" castings on gun spot welders. Made in all standard models

Adapt Automatic Welding to Joints Not Downhand

LINCOLN'S new "3 o'clock" welding process is said to remove the limitation of "downhand welding only" from submerged-arc welding and thus extend the advantages of automatic welding to jobs where the joint is in another position than flat. The new patented process is said to overcome previous difficulties of directing the electrode and retaining the flux and molten metal in a joint not lying flat.

With these new welding methods, procedures and equipment, a horizontal weld may be made with plates positioned anywhere from flat to vertical. Welds can be made in either a straight seam or to follow an irregular contour.

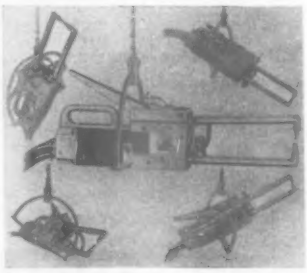
Because joints can be positioned horizontally, welds can be made simultaneously from both sides of the joint. Welding both sides at once reduces arc time on a given joint.

Smaller sizes of electrode wire effect still other savings. Where a 7/32-in. electrode wire would be used on a downhand application, a 1/8-in. or even 3/32-in. wire suffices in a "3 o'clock" position. Smaller electrodes mean lower currents, smaller quantities of flux, less metal wasted in unnecessary build-ups because welds of reduced cross-section are made.

Other advantages of the new process are a minimizing of the effects of distortion and the causes of weld cracking. Tendency toward burn-through is reduced, and back-up strips can be eliminated in cases where there are two arcs on opposite sides of the work.

The process is said to be suited to such applications as the fabrication of piping, box sections, special I-beam and H-sections; joining of clips to automobile bumpers; field erection of large outdoor storage tanks; welding farm machinery parts and machine frames.

THE LINCOLN ELECTRIC CO., Cleveland 1.



SUSPENSION RING fitted with ball bearings makes Miller 10-kva and 20-kva portable spot welders easy to use in any position. Company claims this mounting allows even inexperienced operators to handle efficiently the 80-lb welder. The Miller Electric Mfg. Co., Appleton, Wis.

Portable Gun Welders Weigh 66% Less

FOR EASIER balancing and less lifting on the production line, new Progressive "Magna-Lyte" spot welding guns weigh up to 66% less than previous models. Shape and size remain the same, so other equipment doesn't have to be changed for the new guns.

The "Magna-Lyte" castings are claimed to have high strength, high oxidation and corrosion resistance and high thermal and electrical conductivity. They are available in specially designed variations as well as the following standard models: clam action, push (solid or spring loaded), expansion (cable or without), scissors action, bell crank action, C-type direct action and deep-throat rocker arm. All can be air or hydraulically operated.

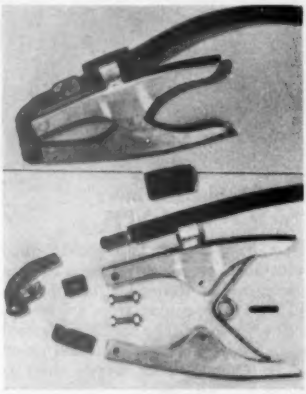
The lightweight guns are recommended wherever (1) the gun is difficult to counter balance (2) the operator must carry the weight of the gun or (3) where the gun must be turned or twisted, raised or lowered to follow the work.

A two-year testing period of these guns in all types of production, preceded their being placed on the general market, says Progressive. So far, the guns are in use in automotive, electrical appliances, metal kitchen furniture and farm equipment plants.

PROGRESSIVE WELDER SALES CO., 3070 East Outer Drive, Detroit 34.

for welding

Startling developments in submerged-arc and gun spot welding lead off New Products for March. Note other cost-saving accessories.



500-Amp Ground Clamp Uses New Connections

THE new "Caddy" welding ground clamp efficiently carries currents as high as 500 amp. It has a pressed steel body, a replaceable copper contact jaw and new connections said to insure high conductivity and lessen wear and fraying. The cable is welded to the contact jaw by the "Cadweld" process (see February issue, page 45).

Cable gripper "ears" hold the cable firmly just behind the weld to prevent flexing and fraying of the uninsulated area. The torsion spring that maintains gripping pressure is completely housed by the steel body of the ground clamp.

ERICO PRODUCTS, INC., 2070 East 61st Place, Cleveland 3.

* * *

500-Lb Welding Positioner Made for Automatic Welding

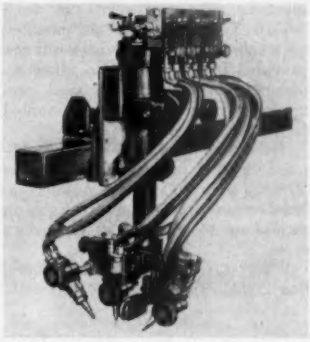
THE new Aronson Model 14BT500 welding positioner was especially designed for automatic welding (submerged-arc, semiautomatic, inert-arc or brazing). For this end, it features a solenoid-actuated clutch for quick starting that allows both the welder and the positioner to start with a touch on a single button.

The worktable rotates on tapered roller bearings at any speed between 0 and 5 rpm. Back-lash is claimed to be almost nil. In addition, the worktable can be tilted in any position about 360 deg and locked in place. The work arm comes in lengths up to 16 in. Capacity of the table is 500 lb.

Model illustrated above has an air cylinder attached to the hollow table spindle so that a pull-bar through the spindle will clamp the work to the table. Air cylinder operation permits fast mounting and removing of workpieces for high production.

ARONSON MACHINE CO., Arcade, N. Y.

* * *



New Machine Flame-Cuts Single or Double Bevels

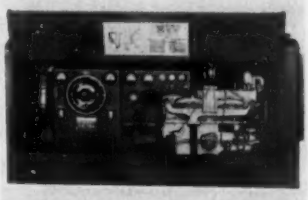
NEW Airco flame-cutting device is said to make exceptionally clean-cut accurate edges on metal plates. It cuts single or double bevels, with or without a land. Spring-balanced, free-floating carriage and castor-wheel assembly will permit bevel cutting over plate undulations by maintaining a constant tip-to-work distance. Any gas cutting machine equipped with a 3-in. square torch bar will take this device.

Cutting torches may be individually positioned in a vertical or horizontal position without changing the bevel angle. Fuel and preheat pressures are initially set with individual torch valves. Once set, the master valve controls turning-on and shutting off gas supply without disturbing settings of the individual torch valves.

This machine is recommended by Airco for shops or factories having any amount of steel fabrication work.

AIR REDUCTION SALES CO., 60 East 42nd St., New York 17.

* * *



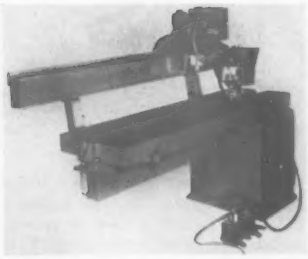
300-Amp Engine-Driven Welder Also Powers Small Tools

FOR field repair and maintenance, Hobart offers a special 300-amp gasoline-engine-driven arc welder with a 3-kw auxiliary power generator. The welder is rated at 40 volts, 300 amp under one-hour resistance load at 1,500 rpm. Controls and instruments are conveniently located on the right or carburetor side of the trailer in two panels; one for welding and the other for the engine. On the left of the engine control panel are located controls and instruments that govern the auxiliary power generator. These include d-c ammeter and voltmeter, rheostat, circuit breaker.

Welder control panel includes a multirange switch, a volt-amp adjuster, ground and electrode cable terminals, a reverse polarity switch and d-c voltmeter and ammeter.

The engine is a water-cooled six cylinder Chrysler Industrial model, directly connected to the welder by a flexible coupling. A sheet-metal canopy completely encloses the welded steel frame; hinged side doors provide access to the control panels, engine and welder.

HOBART BROTHERS CO., Troy, O.



Positioning Fixture Speeds Submerged-Arc Welding

A NEW horn-type welding machine automatically welds seam in sheets or cylinders up to 18 ft long. Welding is done by a "Lincolnweld" head and carriage for submerged-arc welding. Typical applications are: hot water heater shells, air compressor tanks, furnace bodies and water softener tanks. This equipment can weld metals up to ¼ in. thick and down to 14 gage.

The work is placed over the rigid box-section horn. The edges of the seam to be welded are gripped by air-operated copper fingers. Air supply for the clamps comes in through tubes in a hollow box section on top of the horn.

Back-up for the weld is provided by a patented "gremlin" device. An air-operated copper anvil clamps tightly against the back of the seam. In conjunction with the clamps on the edges, a tight, straight fit-up is assured.

The same equipment can also be adapted to automatic brazing, inert-arc welding or other similar processes.

THE CECIL C. PECK CO., 4614 Prospect Ave., Cleveland 3.

* * *

Powerful Hand Grinder Turns at 20,000 Rpm

DESIGNED for constant duty without slowdown, the "Hi-Power Grinder" is claimed to do everything from delicate die jobs to hogging off larger pieces of weld metal.

Operating at 20,000 rpm, the grinder motor is independently mounted and easily detached from its hand piece. Other features include an independent ball-bearing spindle, sealed lubricated bearings and a forced-air ventilated hand piece.

The grinder has a universal Jacobs chuck with ¼-in. capacity permitting the use of a 2-in. grinding wheel or any ¼-in. or ⅛-in. shank-mounted wire brush, sanding drum, felt or soft rubber polishing wheel. It is 11 in. long and weighs 5 lb 10 oz.

The "Hi-Power Grinder" comes in two models, No. 3500 110/120 volts a-c/d-c, 25-60 cycle and No. 3505, a 220 volt size. The grinder comes with eight accessories, including mounted wheels, sander, chuck key and dressing stone.

CHICAGO WHEEL & MFG. CO., 1101 West Monroe St., Chicago 7.

* * *

New Welding Control for Small Spot Welders

NEW synchronous and nonsynchronous control equipment for low-capacity spot welders is housed in a compact cabinet with a side-swinging panel. To make and break the welding current, air-cooled thyratron tubes are included in the control circuit.

For ease of maintenance and inspection, all components in each NEMA Type I cabinet are mounted on a side-swing panel. Knockouts are provided in the cabinet to allow attachment of external electrical connections. Cabinets may be mounted on or near the welder.

Synchronous controls can be supplied in rms current ratings up to 50 amp at a 10% duty cycle. Nonsynchronous controls are available in ratings up to 100 amp at 10% duty cycle.

WESTINGHOUSE ELECTRIC CORP., Box 2099, Pittsburgh 30.

* * *

New Safety Lenses Protect Specially Sensitive Eyes

NEW glasses to protect the eyes of people especially sensitive to light are made from a special glass, "Soft-Lite HT-51", that tones down all visible light rays evenly. When hardened to approved specifications, it surpasses safety requirements of the Bureau of Standards.

BAUSCH & LOMB OPTICAL CO., 635 St. Paul St., Rochester 2, N. Y.

Flexible-Shaft Grinder Turns at 6,000 RPM

NEW flexible-shaft tool can be fitted with abrasive wheels or discs for finishing welds. Rating of the motor is ¼ hp when running from a 60-cycle, 110-volt source. The handle is claimed to be cool running at the rated speed of 6,000 rpm. The flexible shaft is about 4 ft long. Customer has choice of either a ¼ or ⅛ in. collet. A bail is provided for hanging up the motor.

Barton Products, Inc., Defiance, O.

* * *

NEW PRODUCT BRIEFS

Silver plating powder deposits a coat of pure silver on copper, brass or bronze electrical contacts. It is applied with a steel brush or abrasive cloth, clean rag and water. One pound coats 6,000 sq in. The Cool-Amp Co., 8603 S. W. 17th Ave., Portland, Ore.

* * *

Selenium rectifiers provide d-c power for synchronous motors and other products. Rectifiers are rated from 0.75 to 25 kw. They are built without moving parts, except for a fan in the highest ratings. General Electric Co., Lighting and Rectifier Div., Schenectady 5, N. Y.

* * *

Sealed hub industrial wheels made of cast aluminum with a solid rubber tread are designed for foundries, metal shops, mills, warehouses, meat packing and other industrial plants. The sealed hub is said to cut down radically on axle wear. Available in 6 to 20 in. diameters. Aerol Co., Inc., 2820 Ontario St., Burbank, Calif.

Making a NI-ROD weld that cut short what might have been a long, costly wait.

Saved by one package of NI-ROD

. . . this 2000-pound iron casting

Typical of savings possible through NI-ROD repairs is the case of the machine foundation shown above.

A crack measuring 9″ long and 2″ deep was found in a vital part of the base. A quick check proved it too large to ignore, yet too small to warrant scrapping. To recast and remachine would cost several thousand dollars, not to mention the loss of production time.

Welders were called in and, using NI-ROD electrodes, they were able to fill in the defect with ease. The completed weld was ground down to original casting dimensions . . . and a sigh of relief was heaved by all!

Easy-to-handle NI-ROD has made such salvage operations *routine* in many of the nation's busiest plants.

NI-ROD requires a minimum of preparation. Pre-heating or post-heating is seldom needed. NI-ROD welds are *machinable*. And NI-ROD is so easy to use that even welders with limited experience can obtain workman-like results.

NI-ROD works well in all positions, on AC or DC current. Slag removal is easy. Welds are sound, non-porous and a good color match with iron.

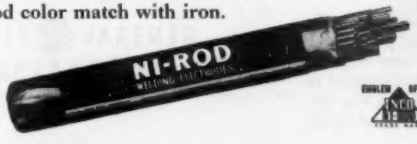
NI-ROD is produced in four diameters: 3/32″, 1/8″, 5/32″, and 3/16″. Your nearest INCO distributor will gladly give you full information on NI-ROD and other INCO welding materials.

. . . .

You may not be able to get the NI-ROD you need these days. For NI-ROD, like other INCO materials, is important to our nation's defense program. A fast, dependable salvage tool in peacetime, NI-ROD now helps to keep war production rolling.

The International Nickel Company, Inc.
67 Wall Street, New York 5, N. Y.

The NI-ROD weld is sound, non-porous, with good penetration and smooth wash. After the weld was ground to shape, the casting was as good as new!



HIGH-VOLTAGE RADIOGRAPHY

cuts exposure time from hours to minutes...

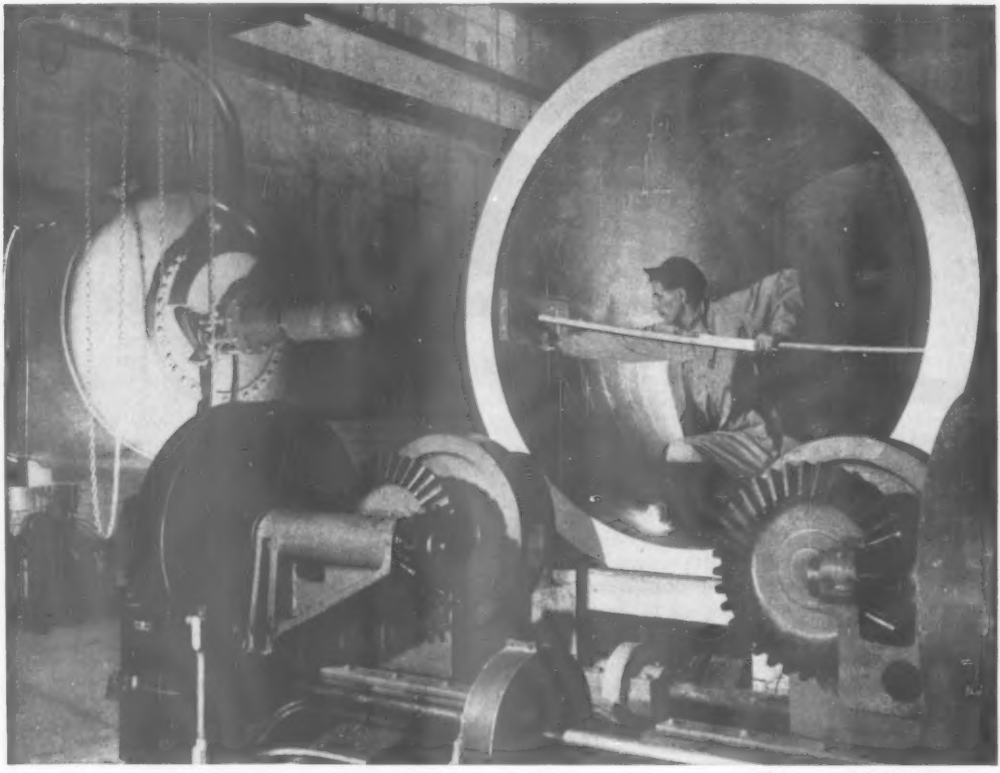


Photo courtesy Babcock & Wilcox

Provides proven dependability year-in... year-out plus low-cost operation

Vessels which would take up to eight hours or longer to radiograph with lower-voltage x-ray units take as little as six minutes with 2,000,000 volt industrial x-ray units like the one shown above. And the detail improvement over low-voltage radiography is dramatically apparent.

Scores of companies rely on high-voltage radiography, not only as an inspection tool — but as a development tool for establishing new welding technics. The high-voltage x-ray unit illustrated is noted for its low-cost operation and absolute dependability. In fact, its economy is summed up by many users like this: "From a cost standpoint, high-voltage x-ray appears to be the more economical method of inspecting fusion welding in pressure vessels."

Radiography may be the answer to your own welding inspection and development problems. Write today for full information. General Electric X-Ray Corporation, Dept. AE-3, Milwaukee 14, Wis.

GENERAL ELECTRIC
X-RAY CORPORATION

Welding Tip Numbers Compared to Drill Size of Orifice

(When cleaning tips, it is recommended that one size smaller drill be used)

Tradename	Series	79 80 78	77 75 76	73 74 72	71 69 70	67 68 66	65 63 64	61 62 60	59 57 58	55 56 54	53 51 52	49 50 48
Airco	All		00	0		1		2		3 4	5	6
Craftsman	AA			0	1			2		3		4
Dockson	4EC, 4SC, 7SC	1		2		3			4	5	6	7
	7EC	1		2		3			4	5	6	7
Gasweld	G25, G35			00 0	1		2		3	4 5	6	7
	G55	00	0	1	2				3	4 5	6	7
	AVG	00	0	1	2		3	4	5	6	7	8
Harris	13, 14, 16, 17, 50	00	0		1		2		3	4	5 6	7
	23, 13-F, 23A swedged, 17-F swedged			00	0	1		2	3	4 5	6	7
K-G	EUS, KUS, KS		75	72		68		62		56	53	50
Marquette	A, A1		00		0	1		2	3	4		5
	B, B1	00B	0B	1B		2B		3B		4B 5B	6B	7B
Meco	All	00	0		1		2		3	4	5	
Milburn	W-200	00 0	1		2			3	4	5	6	7
	W-100				000	00	0		1	2	3	4
	W-600	0000	000	00	0		1	2	3	4	5	6
Oxweld	W-29			1	2		4			6 9	12	15
	W-17						4			6 9	12	15 20
Prest-O-Weld	W-109		1			2		3		4	5	6
	W-110, W-111		1		2	3		4	5	6[1]	7	8
Purox	33	0	1			2		3		4	5	6
	34			1		2				4		6
	35			1		2			3		5	
Rego	GP, GX, GXU, SX			72		68		62	58	55	53	50
Smith	Lifetime				B60		B61		B62	B63	B64	B65
	No. 5				50		51		52	53	54	55
	No. 2	1B	19	A20	A21	A22	A23	A24	A25	A26 A27	A28	A29 A210
Torchweld	GP 570, 870			72		68		62	58	55	53	50
	170	79	76	72		68		62	58	55	53	50
	71		76	72		68		62	58	55	53	50
Victor	All		000	000½	00	00½	0 0½	1	1½	2 2½	3 3½	4
Weldit	All	00	0		1		2		3	4	5 6	7

Tradename	Series	47 [1]/64" 46	45 43 44	41 42 40	39 37 38	35 36 34	33 31 32	1/8" 29 30	27 28 26	25 23 24	21 22 20	19 17 18
Airco	All		7	8		9		10		11	12[2]	
Craftsman	AA			5	6		7[3]	8				
Dockson	4EC, 4SC, 7SC		8	9		10	11	12	13 14	15		
	7EC		8									
Gasweld	G25, G35		8	9 10	11	12 13	14 15	16				
	G55		8									
Harris	13, 14, 16, 17, 50		8 9	10								
	23, 23A swedged, 13-F, 17-F swedged	8	9	10			12	15[4]	19	22		
K-G	EUS, KUS, KS		45	40[5]		35		30[6]		25	20	
Marquette	A, A1	6	7	8		9	10XH	11XH	12XH	14XH		
Meco	All	6		7		8		9	10		11	12
Milburn	W-200		8	9		10	11	12 13		14	15	16
	W-100		5	6	7	8	9	10	12	13	14 15	
	W-600		7	8		9	10					
Oxweld	W-29	20		30				55 70		90		
	W-17		30	40					100		125	150
	W-26											
Prest-O-Weld	W-109	7	8			11	12	13				
	W-111		9	10								
Purox	33	7	8			10						
	34		8		9		11	13		15		
	35	7										
Rego	GP, GX, GXU, SX	46[7]		42		36	31[8]			25	20	
Smith	Lifetime		B66	B67		B68	B69		B610 B611	B612		
	No. 5		5b	57								
Torchweld	GP 570 870	4b		42		3b	31[9]			25	20	
	170, 71	4b										
Victor	All		5			6		7 8	9 10 11	12		
Weldit	All		8 9	10	11	12	14	16				

[1]W-110 to No. 6 Tip only. [2]Airco Tip No. 13 = Drill Size No. 10; No. 14 = Drill No. 2; No. 15 = 1/4 in. drill. [3]Tips No. 7 and 8 require special gooseneck [4]13-F and 17-F Swedged to No. 15 Tip only [5]EUS to No. 40 Tip only [6]KUS to No. 30 Tip only [7]SX to No. 4b Tip only [8]GXU and GP to No. 31 only [9]GP 570 to No. 31 only.

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A Welding Engineer Reader Service

1 LIGHTWEIGHT GUN WELDER—Progressive Welder Sales Co., Detroit 34. 4-page bulletin tells about "Magna-Lyte" gun welders that weigh only a third as much as similarly performing welders. Various designs are shown as well as several applications. See page 44.

2 GRINDING WHEELS—Bay State Abrasive Products Co., Westboro, Mass. 4-page two-color bulletin describes the Bay State "Koolpore" grinding wheels for cooler cutting, faster stock removal, and other advantages. Tool and cutter recommendations are included as are surfacing recommendations.

3 FLAME-BEVEL PLATES—Air Reduction Sales Co., New York City 17. Bulletin tells about the new Airco "Plate-Edge Preparation Device" for flame-cutting single or double bevels on plates. Torch adjustment, setting of fuel and preheat pressures, construction features are explained. See page 45.

4 REBUILDING BUCKETS—The Stuls-Sickles Co., Newark 5, N. J. 6-page pocket-size folder tells about using "Manganal" 11 to 13% manganese-nickel steel shapes for rebuilding and repairing and rebuilding dippers buckets, crusher parts, chutes, sprockets, etc.

5 GROUND CLAMP—Erico Products, Inc., Cleveland 3. Instruction sheet tells about the new "Caddy" ground clamp with welded cable connection and replaceable contact jaws. Other operating features are explained. See page 45.

6 SMALL WELDER CONTROL—Westinghouse Electric Corp., Pittsburgh 30. Bulletin tells about synchronous and non-synchronous controls for small, low-capacity spot welders. Details about side-swinging panel construction and ratings are included. See page 46.

7 WELDING STUDS—KSM Products Inc., Stud Welding Div., Merchantville, N. J. 4-page bulletin gives features of the KSM studs for arc welding and shows how custom-made studs are ordered.

8 PORTABLE GRINDERS — Cummins Portable Tools, Chicago 40. 4-page two-color condensed catalog PT43 describes 7 and 9 in. portable disc sanders and accessories, various size electric drills and power saws. It gives dimensions and specifications for all operating parts.

9 TONG AMMETERS — Columbia Electric Mfg. Co., Cleveland 14. 8-page catalog in two colors explains a tong-type ammeter for measuring a-c and d-c current in welding cables, power cables, motors and other electrical machinery.

10 DUST COLLECTORS—Torit Mfg. Co., St. Paul 2, Minn. 28-page catalog describes cabinet dust collectors in sizes ranging from 1/3 to 5 hp and cyclone separator types from ½ to 5 hp.

THE WELDING ENGINEER will request manufacturers to send readers the literature in which they are interested. Two post cards are printed here, each containing space for four items.

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11 WELDING GUIDE — All-State Welding Alloys Co., Inc., White Plains, N. Y. 32-page pocket size booklet provides a complete guide to all-State welding alloys and fluxes. It is indexed and cross referenced to show the correct rod for any particular job.

12 FLEXIBLE SHAFT GRINDERS — N. A. Strand Div., The Balmar Corp., Chicago 40. 22-page Catalog 31 tells about flexible shaft grinders from 1/3 to 3 hp rating. Accessories, shafting, spindles and hand pieces, couplings and mountings are illustrated and described.

13 REBUILDING WHEELS — The Linde Air Products Co., New York City 17. 4-page pamphlet F-7346 describes the automatic rebuilding of mine locomotive wheels by the submerged-arc welding process. Originally appearing in THE WELDING ENGINEER, the article tells about the lathe set-up, welding procedure and machining.

14 ZINC METALLIZING — Metallizing Engineering Co., Inc., Long Island City 1, N. Y. How the interior of two 15,000 gal. steel water tanks were metallized with zinc in 1934 have stood up to time. Bulletin also tells about metalizing outdoor-type power capacitors.

15 PORTABLE GRINDERS — The Dumore Co., Racine, Wis. 28-page two-color catalog 50 tells about Series 9 portable grinders for cleaning welds. Specifications, dimensions, grinding wheels and other information are listed for this series and many other types of heavy-duty and precision grinding equipment.

16 LOW-TEMPERATURE ALLOYS — Eutectic Welding Alloys Corp., New York City 13. 6-page folder expands to 11 by 23 in. It contains specifications on 100 Eutectic Low Temperature Welding, brazing and hard-facing alloys. A full-page listing of applications and suggested alloys is included.

17 BENDING MANUAL — O'Neil-Irwin Mfg. Co., Lake City, Minn. 32-page two-color manual gives complete directions for making centered-eye bends, off-center eye bends, circles, zero radius bends, scroll bends, square bends, etc. with Di-Acro hand and power-operated bending equipment. Also shown are rod cutters, punches, brakes, shears.

18 INERT-ARC FIXTURES — Air Reduction Sales Co., New York City 17. 12-page reprint ADR 67, "Jigs and Fixtures for Inert-Gas Arc Welding," gives design hints for a specialized welding process. Written by H. A. Huff, Jr. and A. N. Kugler, it originally appeared in *The Welding Journal* and contains 26 photos and sketches.

19 A-C WELDER — General Electric Co., Schenectady 5, N. Y. Single-sheet, two-color bulletin GEC-553 tells about the type WK20H a-c welders with hot-start control and silicone insulation. Specifications and current characteristics are listed and illustrated.

20 MEDICAL GAS VALVES — The S. S. White Industrial Div., New York city 16. 8-page bulletin 5012 describes and illustrates four models of valves for medical oxygen, nitrous oxide, carbon dioxide and mixtures of carbon dioxide and oxygen.

21 RADIOACTIVE PROTECTION — Mine Safety Appliances Co., Pittsburgh 8. 8-page booklet G-10 presents a description of the MSA "Airline Weldors Mask" for welding in radioactive or toxic contaminated atmospheres. Air sampling outfits, ventilation accessories, protective clothing, artificial respiration equipment and other safety devices are also discussed.

22 AIR CYLINDERS — The Bellows Co., Akron 10. 30-page bulletin CL-30 tells about the Bellows "Air Motor," an air cylinder with built-in valve and speed control regulators for actuating feed tables on spot welders, work holding devices, etc.

23 STAINLESS FABRICATION — Armco Steel Corp., Middletown, O. 12-page booklet, "A Stainless Profit Story for the Paper Industry" tells about Armco stainless uses in the paper industry and gives suggestions for operation and care of such equipment. It includes a discussion of Armco's ELC series of stainless that eliminates intergranular corrosion next to welds.

24 CLAD STEELS — Lukens Steel Co., Coatesville, Pa. Single-sheet folder, No. 540, lists six variations of same vessel made with differing materials such as chromium stainless, chromium-nickel stainless, solid nickel, chromium-clad, chromium-nickel-clad and nickel-clad steel.

25 HOSE REPAIR TOOL — Victor Equipment Co., San Francisco 7. Single-sheet bulletin shows picture and tells how to operate a ferrule crimping tool for attaching hose couplings. Complete working instructions are explained.

THE WELDING ENGINEER will request manufacturers to send readers the literature in which they are interested. Two post cards are printed here, each containing space for four items.

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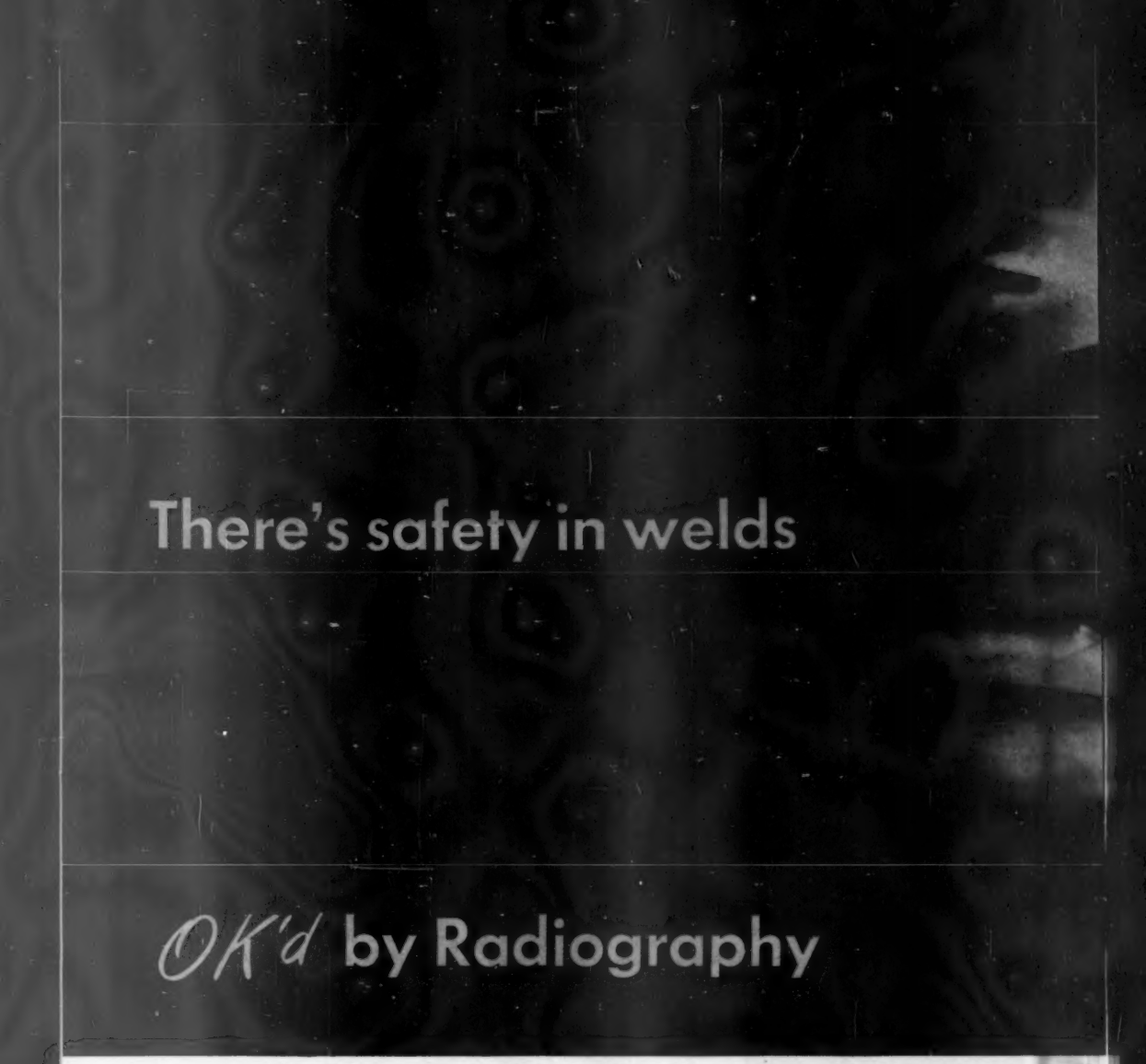

Radiographs showing welds in gas tanks. Lower radiograph shows acceptable tank weld.

These radiographs show the welds in propane gas tanks. The upper discloses a lack of fusion and heavy gas porosities. Out of a lot of several hundred tanks, Radiography showed a dozen to be hazardous—twelve potential accidents that were prevented.

Because Radiography can prove the soundness of welds it is opening new fields to welders in manufacturing pressure vessels and in other applications where welding was once barred, it is now an accepted procedure.

This is why Radiography can help you build your business as well as earn a reputation for highly satisfactory work.

If you would like to know more about what it can do for you in your own work, discuss it fully with your x-ray dealer.

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another important function of photography

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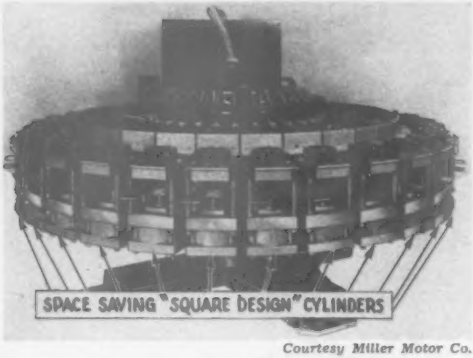
on the job



Courtesy Miller Motor Co.

EACH STATION in "Cyclewelder" for automotive brake bands has its own air cylinder and thermostat control

Courtesy Tube Turns, Inc.

WELDED PIPING will convey chilled water at 45 F to air conditioning units at Higbee department store, Cleveland

Air-Powered "Cyclewelder"

(See left top picture)

AIR POWER is the key to a 30-station multiple "Cyclewelder" designed by the Hautau Engineering Co., Detroit, for the volume production of automotive transmission brake bands. Each of the 30 stations is, in effect, an independent press, having its own air cylinder, replaceable thermostatic control and electrical connections.

The air cylinders are of a space-saving square design, developed by a Chicago manufacturer of air and hydraulic cylinders. The 30 stations of the machine were built into a compact circular table, 9½ ft in diameter, that allows convenient accessibility to center slip rings and air headers from a standing position. Conventional circular "bolted" cylinders of the same bore would have required an 18-ft-diameter table, occupying over 3½ times the floor space.

The machine needs only one operator, who loads the rings and liners, then trips the expander valve lever. The worktable rotates at variable speeds of from 3 to 6 minutes per revolution, depending upon the "cure time" required. Cyclewelding operation requires a temperature of about 450 F and lining area pressures of from 200 to 450 psi.

Despite its name, "Cyclewelding" isn't any form of welding but a method of joining two materials with a cementing agent. The assembly is bonded in somewhat the same fashion that two thicknesses of plywood are laminated with plastic glue. The process, however, produces physical properties well in excess of ordinary cementing or glueing (see THE WELDING ENGINEER—January, 1947, page 48).

* * *

Courtesy The Linde Air Products Co.

FLAME-GOUGING to remove root of outside weld on an autoclave

Flame-Gouged Autoclaves

BLAW-KNOX CO., Blawnox, Pa., finds that flame-gouging is important to the manufacture of autoclaves. The process is used to remove root passes to leave a groove for the welding of interior seams.

Flame-gouging differs from ordinary flame-cutting in that the cutting action doesn't go all the way through the metal being cut. The special tip used delivers a relatively large jet of oxygen at low velocity.

An autoclave is a vessel for such uses as sterilizing, cooking, chemical processing, etc. by means of superheated steam under pressure. One of those fabricated at Blaw-Knox for the chemical processing industry has a shell about 7 ft in diameter. Exterior welds are made to join the shell to the head and jacket bar. Before making the interior seam, a flame-gouging tip with a cutting-oxygen orifice of about ¼ in. is used to cut away the bottom or root of the initial weld. The interior head seam is then chipped with a hammer to assure clean metal for welding.

The body of the autoclave is of carbon steel: the head is clad with type 347 stainless steel on the interior.

* * *

Piping for Air Conditioning

(See right picture)

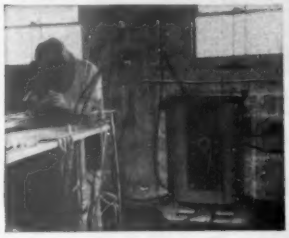
THE WELDOR shown in above picture is working on a 12-in. pipe line that is part of the network of piping required for the air conditioning of the Higbee Company's modern department store in Cleveland.

A million-dollar installation, the project was completed without the loss of a single day's business. Refrigeration capacity of 2,800 tons is developed by three 800-ton centrifugal compressors. Chilled water at 45 F is pumped from the refrigeration condensers through 12-in. lines to individual air conditioning units. Condenser water for the Freon compres-

READERS: Any ideas for "On the Job"? Send them to the Editor, 520 N. Michigan, Chicago 11

sors is circulated at the rate of 8,400 gallons per minute through 24-in. lines that run from the compressor room in the sub-basement to the cooling tower on the roof.

Welding fittings made possible space-saving piping designs in the restricted areas encountered, and are contributing to the installation's excellent performance records. Welded pipe and welding fittings are also used in the air conditioning systems of such well-known buildings as the Pentagon, Rockefeller Center and the Chicago Merchandise Mart.



Courtesy Harnischfeger Corp.

Hike Window Production 70%

A.B.C. STEEL Equipment Co., Inc., Tampa, Fla., employs 11 weldors for a daily production of approximately 500 window frames. Frames of various sizes and shapes are fabricated from aluminum and stainless steel sheet and extruded forms 1/16 to ½ in. thick.

With metal-arc welding as the method of fabrication, the components had to be degreased before welding and it was necessary to sand and polish them afterwards. These operations slowed production since they involved considerable preparation and finishing time.

Recently, the firm decided to try out an inert-arc welder (see picture above). The benefits were immediate. In time alone, inert-arc welding saved 70% over the older method. Naturally, the production cost per frame is substantially less. The management is highly pleased with the results, and the weldors like to use the inert-arc welder.

The work is set up in jigs, which were supplied by the New York plant of the A. B. C. Steel Co.

• • •

Abraham Lincoln said:

"You cannot bring about prosperity by discouraging thrift. You cannot keep out of trouble by spending more than you earn. You cannot help little men by tearing down big men. You cannot help the poor by destroying the rich."

PAGE
Stainless Steel
WELDING ELECTRODES
Armor Welding Electrodes
. . . and All Standard Types
AC or DC . . . the BEST
. . . for any weld
on all types
of stainless steel
STAINLESS STEEL
has great strength . . . but its strength is limited by the quality of welds which seal the joints. In all kinds of manufacturing—military work in particular—stainless is being used more widely. If you weld stainless, choose electrodes with care.
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PAGE WELDING ELECTRODES

Photo courtesy Bethlehem Steel Co.

HUGE CROWN of 8,000 ton hydraulic press for aircraft industry is welded from 6-in. plates and castings

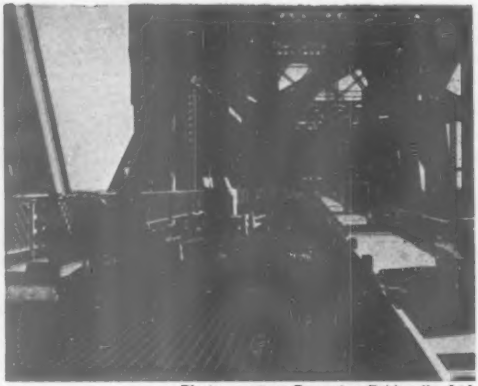

Photo courtesy Dominion Bridge Co. Ltd.

WELDED GRID flooring will strengthen new roadway over Quebec Bridge, world's largest cantilever bridge

NEWS

IAA to Meet in Montreal, Three Days, May 21-23

Two innovations will mark the 1951 annual meeting of the International Acetylene Association. First, it will be held outside of the United States, and secondly, the meeting will extend over three days instead of the customary two.

The Hotel Windsor, in the heart of downtown Montreal, has been picked as the site of this year's meeting. Those who wish to combine pleasure with business will find that Montreal, the New York of Canada, has much to offer in the way of entertainment.

The meeting starts on Monday, May 21 with registration from 10 a.m. until the president's reception at 11:30. The president's reception is followed by a luncheon, at which the James Turner Morehead Medal will be presented. A technical session begins at 2 p.m.: the tentative program calls for talks on the training of welding personnel and on design, production and maintenance problems.

The annual business meeting will be held at 9 a.m. Tuesday and will include the election of new officers and directors. Other technical sessions will be held at 10 a.m. and at 2 p.m.

As a final touch, a plant visit has been scheduled to Shawinigan Falls, the home of Shawinigan Chemicals, Ltd. This will require all day Wednesday as it involves a 3-hour train ride each way as well as an afternoon at the plant.

* * *

Welded Roadway Modernizes Famous Quebec Bridge

WELDED grid flooring is doubling the width of the roadway over the famous Quebec bridge from the south bank of the St. Lawrence to Quebec City. The largest cantilever bridge in the world, it was originally built in 1917 for railway traffic only. Space between the original rail tracks allowed a 15-ft roadway to be added in 1929.

Since that date highway traffic has so increased that the narrow roadway has become a bottleneck, especially during rush hours. Rail traffic, however, has decreased so that it is now possible to do away with one set of railway tracks over the bridge and make a new roadway 30 ft wide.

Construction will be done in two parts: first, the new half section of roadway over the abandoned railway track (nearly completed in above photo), second, removal and replacement of the present roadway after the first section is opened to traffic. More than 100,000 sq ft of 3-in. "I-Beam Lok" steel grid flooring, manufactured by Dominion Bridge Co., Ltd. under license from U. S. Steel corporation, will be used.

Further improving the approach to Quebec from the south bank of the St. Lawrence River, a new 780-ft bridge carrying a three-lane highway has just been completed across the Chaudière River on the same alignment as the Quebec bridge.

Dufresne Engineering Co. Ltd. is the contractor for the Quebec government on the job. Welded fabrication and erection of the steel work is by Dominion Bridge Co., Ltd.

* * *

201 Distributors Now NWSA Members

A STEADY rise in membership of welding distributors in the National Welding Supply Association has resulted in an enrollment of 201 members, as of December, 1950. This amounts to more than 470% increase in the 3½ years' existence of the association. When NWSA started in May, 1947, it had 43 members.

* * *

Eutectic Celebrates Ten Successful Years

EUTECTIC Welding Alloys Corp., New York City, recently marked its tenth year in business. Though 1950 was a big year for Eutectic, it plans bigger things for 1951 including new alloys for various metal-joining applications, says Rene D. Wasserman, president.

The company's new engineering and general offices building will be occupied in March. The new facilities will help expand the company's consultation-demonstration service now extended through a 200-man field force. Production of welding rods in the company's new factory at Flushing, N.Y., will also be stepped up.

Longer Life

with COLMONOY hard facing

Reports from every industry show longer equipment life after hard facing with Colmonoy.

Colmonoy hard facing shows the way to longer life for your equipment and machine parts. No matter what is the cause of wear, Colmonoy has the answer to restore worn parts and protect your new parts. You'll find protection against abrasion, corrosion, and impact in its complete line of hard facing alloys. Depending on your needs and facilities, Colmonoy is available in the form of rods, electrodes, paste, powder, metallizing wire, and castings. Colmonoy offers other advantages:

Easy to apply. Any weldor, without special training, can pick up Colmonoy and do a good job. No danger of expensive rejects. Colmonoy reduces welding time on every job.

Lower welding temperatures. Lower temperatures means less chance of part distortion. You save on gas or welding current, too.

The Sprayweld Process. Powdered Colmonoy can be sprayed and then welded to the part. Spraywelding uses less material and is faster than hand-welding. A Sprayweld surface is smooth and can be held to within .010". No patching or rejects. Write for more information.

Complete engineering data for applying Colmonoy on typical jobs in any industry available on request.

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WALL COLMONOY

CORPORATION

HARD FACING ALLOYS

[illegible] JOHN R STREET · DETROIT 2, MICHIGAN

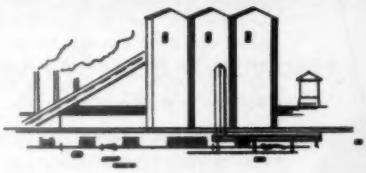
AGRICULTURE

Plow shares treated with Colmonoy sweat-on paste hold their edges and last up to 17 times longer.

CHEMICAL and OIL REFINING

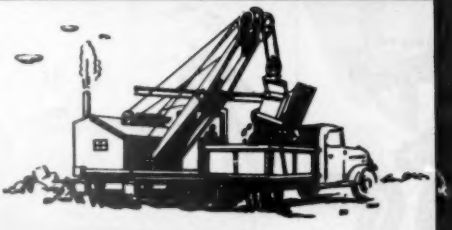
Pump parts spraywelded with Colmonoy No. 6 give 600% more service even when operating in Caustic or Sulphuric.

Valves, operating in even the most corrosive mineral acids, last 5 times longer when protected with Colmonoy No. 5 rod.



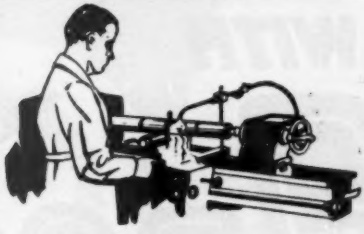
CEMENT

Mill hammers faced with Colmonoy No. 1 crush 300% more rock.



CONSTRUCTION

Shovel teeth built up with Colmonoy No. 1 reduces maintenance cost over 70%



METALWORKING

Colmonoy center tip castings soldered on new or worn centers wear from 7 to 10 times longer.

The TENSILEND Series

You'll be dollars ahead if you put ARCOS' specialized experience in high tensile welding to work on your jobs. ARCOS has pioneered in the development of low hydrogen electrodes and now offers its Tensilend series to supplement its Manganend and Nickend grades. This NEW makes available the most complete line of low hydrogen electrodes with the widest range of applications in the high tensile field.

Special stainless type coatings; baking and packing to reduce moisture absorption after delivery; and other rigid quality controls assure you of "high-test" performance in the shop and in the field. There's no need for preheating (even in heavy sections) and underbead cracking has been eliminated. If you run up against any problems in welding high strength steels, we'll be glad to give any help we can.

ARCOS CORPORATION
1500 South 50th St., Philadelphia 43, Pa.

The ABC'S of Welding High Tensile Steels

Write for "The ABC's of Welding High Tensile Steels" for helpful, technically accurate, but easy-to-read information that shows the way to better welding results.

WELD WITH ARCOS

Specialists in Stainless, Low Alloy and Non-Ferrous Electrodes

Black & Decker to Build Plant at Hampstead, Md.

A BRANCH plant for the manufacture of portable electric tools will be built on a 180-acre site at Hampstead, Md., by The Black & Decker Mfg. Co. The property is about 21 miles northwest of Towson, Md., where the present Black & Decker plant is located.

Ground breaking for the new plant is expected to start in April or May. When it is finished, about a year later, from 300 to 400 people will be employed. The company's engineering, purchasing, sales and administrative functions will remain at Towson.

Other Black & Decker plants are in England and Australia with wholly-owned subsidiaries in Canada, Mexico and Brazil.

* * *

Welded Diesel Cars Sent to Australia

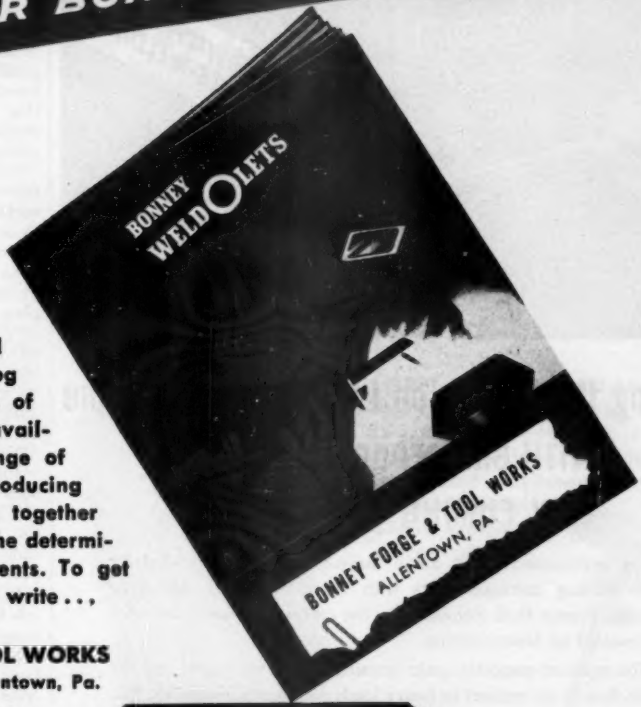
FIRST foreign shipment of Budd's new self-propelled rail Diesel cars was made recently to Port Augusta, Australia. The three cars will be operated by the Commonwealth Railways of Australia between Port Pirie on the south coast and Kalgoorlie in the west.

First introduced by The Budd Co. in 1949, these welded stainless-steel cars were well received by railroads in this country. So far 30 have been bought by domestic railroads and 15 ordered by foreign lines. They are powered by two 275-hp Diesel engines operating through torque converters that drive the RDC's at speeds up to 83 mph. They can be run in units or in multiples as a train.

"Gee, Boss! I didn't know you were in there!"

ANNOUNCING

A BRAND NEW CATALOG FOR BONNEY WELDOLETS



Contains complete and up-to-the-minute catalog information on all types of Weldolet welding fittings available. Presents a full range of sizes and schedules, introducing many new applications, together with simplified data on the determination of code requirements. To get your copy of this catalog, write . . .

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WELDOLETS

WELDING FITTINGS FOR ANY PIPING SERVICE

Putting the Breaks on Lost Production Time

WITH BRIDGEPORT'S No. 192 LOW FUMING BRONZE ROD

Major replacements and costly down-time can be avoided by braze-welding damaged parts with Bridgeport's No. 192 Low Fuming Bronze Rod. For example, the castings shown above were all repaired by braze-welding.

The repaired magnetic brake housing for a 3-ton crane, and the cable sheath, are subject to heavy loads and rough treatment. The worn impeller for a 4" water pump was built-up with bronze, bringing it back to its original efficiency.

Bronze welding is probably the cheapest welding method because it conserves time. Over-all preheating and slow cooling are avoided. Bridgeport's No. 192 Welding Rod has a low melting point and excellent "tinning" and "filling" characteristics. The resulting deposit is strong and tough, yet easily machined.

Would you like more information on Bridgeport's No. 192 Welding Rod and the other alloys available for every type of job? Then write for your free copy of "Bronze Welding Alloys".

"Bridgeport" BRASS Co.

BRIDGEPORT BRASS COMPANY
Bridgeport 2, Conn. Established 1865
Mills at Bridgeport, Conn., and Indianapolis, Ind.
In Canada: Noranda Copper and Brass Limited, Montreal

Bronze Welding Rod A PRODUCT OF
BRIDGEPORT BRASS

Australians Weld Silver and Zinc by Inert-Arc

WITH recent availability of high-purity argon in Australia, chemical and food-processing industries have been quick to use inert-gas-shielded arc welding to fabricate aluminum and copper shapes.

As one example, the Colonial Sugar Refining Co., Ltd., built six storage vessels 13 ft. long and 8 ft. in diameter from 3/16-in. 1S aluminum sheet. A filler rod of 1S aluminum was deposited in the weld joints with the inert-arc torch. Colonial also used this process to weld considerable lengths of pure silver piping for its refinery.

Large stainless steel vats are being fabricated by inert-arc welding for various Australian breweries, among them The Emu Brewery Co.

Deoxidized copper sheet has been inert-arc welded into tanks for nitroglycerine storage at the explosives plant of Nobel (Australia) Pty. Ltd. At the same plant are argon-arc welded aluminum "dope" buggies. The latter are made from aluminum sheet ½ in. thick supported on an aluminum tubular frame. To the base of the "buggy" is welded a casting of 5% silicon-aluminum alloy.

Inert-arc welded aluminum cathodes for the electrolytic deposition of zinc are used by the Electrolytic Zinc Co. of Australiasia Ltd. Formerly, cathodes were fabricated by riveting two copper headbars, one on each side, to the top of the aluminum cathode sheet. These headbars formed the support for the cathode when in the cell and served to conduct the current from the bus bars. Creep and splash from the acid electrolyte attacked the headbars, dissolving small amounts of copper and washing it down into the solution.

The presence of this copper in solution accelerated corrosion of the aluminum sheet between head and solution level. Attempts to do without the copper headbars by substituting riveted aluminum headbars failed because of poor electrical conductivity.

—McGraw-Hill World News

• • •

Flexible Tubing Corp. Opens a New Plant

A NEW $100,000 factory expected to triple production capacity was recently occupied by the Flexible Tubing Corp. at Guilford, Conn. The firm's flexible tubing is used to carry off welding fumes and gases. The new plant contains more than 15,000 sq ft of manufacturing space.

National Production Authority Plans Welding Section

DALE D. SPOOR, equipment sales manager of Air Reduction, will head the Welding Section of the Metalworking Machinery Branch, Machinery Division, National Production Authority.

Recent conflicting materials and manufacturing problems in the welding equipment industry have alerted the NPA to the need for special knowledge in this field. The new executive will work with all manufacturers applying to NPA for information on welding equipment production.

Plans are underway for holding a Welding Industry Advisory Committee meeting in the near future, according to Marshall M. Smith, director, Machinery Division Industry Operations Bureau.

* * *

Omaha Welding Confab Set for March 27-29

THE Thirteenth Annual Welding Confab staged by the Omaha Welding Co., Omaha, Nebr., will take up Tuesday through Thursday, March 27, 28 and 29. The mid week dates allow exhibitors and visitors to be at business or with their families the first and last of the week. William H. Schneiderwind, president of Omaha Welding, announces that the Confab will follow the general pattern of former conferences, including welding exhibits of various processes, lectures on welding subjects and demonstrations of equipment.

* * *

H. K. Clark Munitions Board

H. K. (Tony) Clark, president of The Carborundum Co., is back in Washington as vice-chairman for production management, Munitions Board. Formerly with the War Production Board, Mr. Clark will now supervise the Office of Management and Industrial Security, Office of Military Production Programs, the Facilities and Construction Division and the Aircraft, Petroleum and Electronics Division.

* * *

Five New NWSA Members

NEW memberships gained at the Western Zone Meeting of the National Welding Supply Association at San Francisco, Feb. 9 include these firms: Craig Welding Supply Co., Los Angeles 58; Moore's Welding Supply Co., Sacramento, Calif.; Kern Welding Supplies, Bakersfield, Calif.; Oxygen Sales & Service, Inc., Tacoma, Wash. and Birdsell Mfg. Co., Inc., Mt. View, Calif.

Brazed in less than 60 seconds ... with EASY-FLO 45

THE REFILLABLE SPRAY BOMB at right is mass produced by the RE-ALL Corp., Houston, Texas, in quick time — thanks to the exceptional free-flowing properties and fast penetrating action of the low-temperature silver brazing alloy, EASY-FLO 45.

LEFT—Steel shell and heavy-wall steel tube are joined with two EASY-FLO 45 wire rings (arrows) preplaced. Both joints are brazed simultaneously with automatic gas-air burner heating in under 1 minute.

RIGHT—Assembly of two brass screw machine parts and brass tube is brazed with oxyacetylene torch and EASY-FLO 45 fed by hand, in 15 seconds.

SEND FOR THIS NEW BULLETIN 20

It gives the whole remarkable story about EASY-FLO brazing plus a lot of valuable information about joint design and fast heating and production methods. Write for a copy today.

HANDY & HARMAN FOUNDRY QUALITY SERVICE

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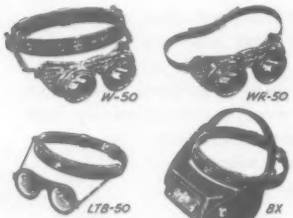
82 FULTON STREET • NEW YORK 38, N. Y.

Headrest Goggles W-50

8 oz. of Prevention

First, in making these goggles, came *Safety*: protection against injurious light rays from front and sides . . . and against flying particles; easy adjustment for proper fit, in goggles and in headrest.

Comfort came next. Properly adjusted, they bear gently against the face. Weight is evenly distributed about the head. One hand, a few seconds, and they are raised or lowered. Lightness too makes for comfort. At eight ounces, these headrest goggles are the lightest of their kind on the market.



For Gas Welding, Cutting and Brazing, with lenses in F.S. shades 3 thru 6: types W-50, LTB-50, and BX with headrests, type WR-50 with elastic band.

For Chipping and Grinding, with clear, hardened lenses: type G-50 with headrest, type GR-50 with elastic band.

For Flash Welding and Metal Pouring, with visors in light, medium and dark green, .020" thick, 4", 6", and 8" deep: type J-1 shield with headrest, type C shield with elastic band in back.

For Resistance Welding, Metal Finishing, Woodworking, etc., with visors of clear plastic .020", .030", and .040" thick, 4", 6", and 8" deep: type J-1 shield with headrest, type C shield with elastic band in back.

JACKSON PRODUCTS
WARREN · MICHIGAN
Sold through Dealers Everywhere

Steel Capacity to Increase to 117,500,000 Tons a Year

STEEL company expansion plans greatly accelerated in the past three months, will raise the total annual steel capacity of the United States to 117,500,000 tons at the end of 1952, the American Iron and Steel Institute announced recently. The new record high level is based on an industry-wide survey just completed by the Institute.

The total increase will be the largest ever accomplished in a short term period anywhere in the world. Over 18 million tons will have been added to total annual capacity in three years from the start of 1950 to the end of 1952. An increase of nearly five million tons was achieved last year, with the result that the annual steel capacity of the United States is now more than 104 million tons.

The scheduled rapid growth to the level of 117,500,000 tons in two more years is over 7 million tons larger than that predicted in an announcement last October by Secretary of Commerce Charles Sawyer on the basis of the best information then obtainable. The reason is that several companies have now completed plans for a number of large projects that were not completely mapped in October.

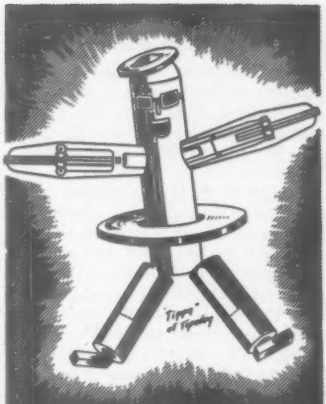
By the end of 1952 steel capacity will have grown nearly 36 million tons from 1940, an increase of nearly 45%. That amount of increase exceeds the entire capacity of any other country in the world.

At full-capacity operations over the course of a year, the 117.5 million tons of capacity will enable the production of about 19½ million tons more steel than was made last year in all the world outside the United States, according to an average of world production estimates by two trade publications. That high production will be about 28 million tons more steel than was required by the United States in 1944, the biggest year in World War II.

To help support the great gains in steel capacity, the steel companies have been enlarging their blast furnace facilities, coke oven capacity, rolling mills and other finishing facilities. Also more ore boats and other transportation facilities are being added.

The total blast furnace capacity, rated at 72,471,780 tons at the start of 1951 (a record high level) will be increased to about 79,300,000 tons by the end of 1952.

The raw materials requirements required for full-capacity operations at the end of 1952 will be tremendous.



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- Longer life.
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- Cuts production costs, yet costs no more than the ordinary electrode.

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For example, more than 150 million tons of iron ore will be needed annually. Huge amounts of coal, limestone, manganese, scrap and other raw materials will be required, as well as record high amounts of natural gas, electric power and fuel oil.

The extent of the steel companies' plans was announced by the Institute after totaling expansion figures furnished by steel companies. It was the third survey in six months. The first survey last June showed that total capacity at the end of 1952 was expected to exceed 105 million tons. In October the announcement by Secretary Sawyer raised that total to 110 million tons. Subsequently, additional large projects were announced by the individual steel companies.

Steelmaking furnaces at present are being operated at the highest level ever attained. During the week of Jan. 22, more than two million tons of steel were poured for the first time in history. The present high production, if continued without interruption for one year, would result in an annual output of more than 105,000,000 tons of steel. In 1950, about 96,700,000 tons of steel were made.

• • •

Portable Tool Firm Now Cummins-Chicago

CUMMINS-Chicago Corp. is the new name of the firm formerly known as Cummins Business Machine Corp. President Paul Jones indicated the 64-year-old company's new name is more in keeping with its enlarged activities in the fields of perforating machines and electric portable tools.

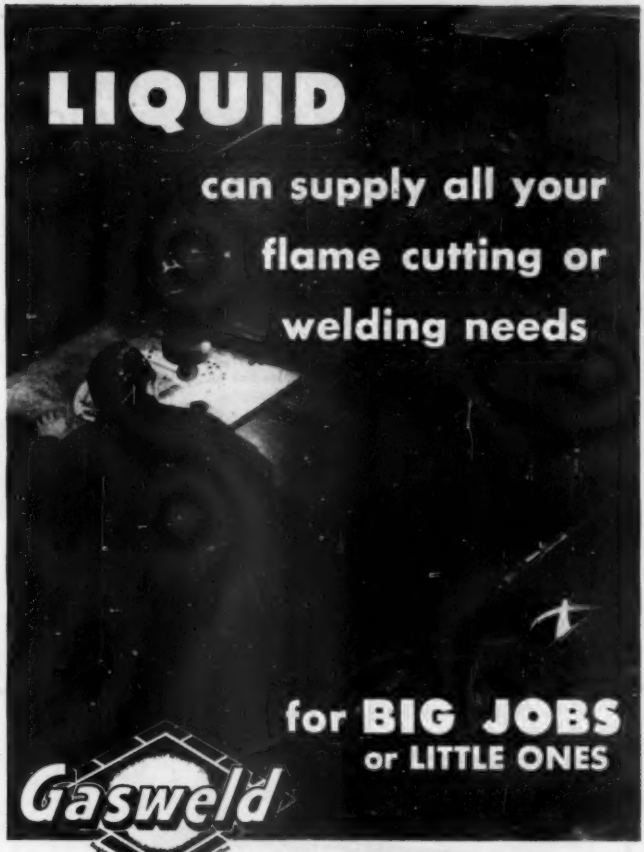
Cummins entered the electric portable tool field in December, 1945. Its portable tool division makes a line of electric saws, drills, grinders and polishers for industrial use.

• • •

Commence Making Oxygen At New Colorado Plant

THE first oxygen made by the Western Slope Oxygen Co., Grand Junction, Colo., was produced in January. For the time being, acetylene distributed by the firm is obtained from Salt Lake City. Besides its compressed gas line, the firm handles arc and gas welding equipment and supplies. Its territory will be the western slope of Colorado.

John R. Dalholtz is president, Mark Lord is vice-president and Wayne O. Fleming is secretary-treasurer. Mr. Dalholtz has been associated with oxygen production for many years and supervised government production of this gas in the Japan area immediately after World War II. Mr. Lord and Mr. Fleming have been in business operating the Western Saw Mill Repair Co.



Whether you're building a battle wagon or doing simple soldering, it will pay you in time and money saved to talk with "LIQUID" *first!* "LIQUID'S" complete, wide-variety line of welding and cutting equipment meets every industrial need —standard units can perform all types of special work. From torches to gases, "LIQUID" is a single, dependable source of unfailing supply! *Write today for new GASWELD catalog—it's free!*

Plus DEPENDABLE Gases IN ANY QUANTITY

"LIQUID" Red Diamond Oxygen, Acetylene, Nitrogen and Hydrogen

Trailer trucks in capacities up to 45,000 cubic feet of oxygen simplify gas supply for larger users

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Industrial Gas Division
3110 South Kedzie Avenue • Chicago 23, Illinois

Oxygen and acetylene producing plants and distributing points are located in Philadelphia, Buffalo, Cincinnati, Louisville, Toledo, Detroit, Milwaukee, Chicago, San Francisco and Los Angeles (Stuart Oxygen Company) and Canada (Imperial Oxygen Limited).

An Unbeatable Combination!

SILVALOY SILVER BRAZING ALLOYS

The Silvaloy group consists of 7 popular silver brazing alloys high in tensile strength and producing strong, ductile joints on ferrous and non-ferrous metals.

	SILVER CONTENT	MELTING POINT	FLOW POINT
SILVALOY 50	50%	1160 F	1175 F
SILVALOY 45	45%	1125 F	1145 F
SILVALOY 40	40%	1135 F	1205 F
SILVALOY 35	35%	1125 F	1295 F
SILVALOY 20	20%	1430 F	1500 F
SILVALOY 15	15%	1185 F	1280 F
SILVALOY 503	50%	1195 F	1270 F

1200 All-Purpose Flux—for use on all metals. No. 1200 Flux readily dissolves oxides during brazing operations and aids in the flowing of the alloy. Meets all government specifications.

1100 Low Temperature Flux—superior where exceptionally clean surfaces on copper or copper alloys are required at lower temperatures.

COMPLETE STOCKS

Oxy-acetelyne welding rods and flux for cast iron, steel, aluminum, brass, copper, bronze, nickel, monel and inconel.

STEEL SALES CORPORATION

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BRANCH PLANTS: Detroit, St. Louis • BRANCH OFFICES: Milwaukee, Minneapolis, Grand Rapids, Indianapolis, Kansas City, Mo.

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YOU CAN PAY MORE...BUT YOU WON'T GET BETTER EYE PROTECTION!

THE ORIGINAL CHAMPION

EYEGARDS

WITH 10-WAY VENTILATION

BEST THING NEXT TO YOUR EYES

You can give your men the "best" in eye protection without paying premium prices by getting Eyegard goggles. There's extra comfort in them because the super-light plastic is molded to form-fit the face . . . greater protection because the goggles are impact resisting . . . extra ventilation through three large vents at side of cup and seven additional vents around the lenses. Cool and fog-free. With all these superior features, they cost no more than ordinary goggles. Next time you order, get Eyegard goggles, and save the difference! Write for free catalog.

No. 31 Grinders and Chippers Goggles

No. 335 Welders Coverspec Goggles

AMERICAN INDUSTRIAL SAFETY EQUIPMENT COMPANY

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DIVISION OF THE BURDETT OXYGEN COMPANY • CLEVELAND, OHIO

New X-Ray Inspection Uses Crystal Detectors

HIGH speed, automatic X-ray inspection of thousands of industrial products is in the cards for the future. General Electric X-Ray Corp. announces new "semi-conductor" crystals, which, when excited with X-radiation, release masses of electrons that can be harnessed to operate various mechanisms.

The crystals amplify the energy they receive 1,000,000 times. On an area for area basis they are 1,000,000 times more sensitive to X-rays than ionization chambers and 1,000 times more sensitive than photo-electric cells.

Because of this sensitivity and their tremendous electron discharge, they can be used with relatively inexpensive, low-intensity X-ray machines with ratings of 20,000 volts and one milliampere.

Test set-ups comprise an X-ray tube that sends a narrow pencil-like beam of rays through two collimators (a lens device) into the object to be inspected. When a gap or defect appears in the object, the X-rays leap across it into the new crystal detector. The crystals instantly set a relay in action, which can operate a meter, ring a bell, flash a light, dab red paint on the bad part or stop the production line.

The new crystals are "grown" in General Electric X-Ray's Coolidge Laboratory by Dr. John E. Jacobs, 30-year-old company engineer and Dr. Rudolf Frerichs of the physics department at Northwestern University. They range in size from a fraction of a millimeter to several millimeters in cubic size.

• • •

Seamen Warned to Watch Welding Cables at Drydock

REPAIR gangs coming aboard ships tied for maintenance or in drydock are apt to trail after them a mass of air lines, gas lines and welding cables. These will lie on deck at the head of the gangway and along passageways, where they often trip crew members, longshoremen or visitors, warns the *Seaman's Safety Guide*.

Since the cables and hoses must be on deck (at least in the immediate working area), the *Guide* suggests that they be gathered into a bundle that can be kept along the very edge of passageways and out of the way. To keep cables from under foot in other areas, the ship should provide hooks, ropeyarns or short pieces of line to lash hoses and wires to the overhead, handrails or stanchions.

Hard-to-Handle Fluorine Makes Hot Torch Flame

THE world's most active chemical, fluorine, will make steel, glass and even water burst into flame on contact. It will combine with just about every other material under suitable conditions. We wouldn't have made the atom bomb, perhaps, without fluorine's ability to combine with uranium.

If it can be controlled, fluorine and its compounds offer fabulous possibilities for products and services in modern living. For instance, the fluorine-hydrogen torch has a flame so hot it will cut copper, a feat previously almost impossible because the copper would conduct heat away before it melted.

A heat-resisting fluorine liquid with a boiling temperature near that of mercury makes possible the high efficiencies of the mercury turbines at less cost and without the dangers of mercury. Non-inflammable anesthetics that will not accidentally explode in operating rooms have been developed from fluorine.

Strangely enough, though fluorine is the most active of all elements, some of its compounds are among the most inert discovered. From highly stable fluorine-carbon compounds, chemists make plastics, insecticides, lubricants, tanning agents, anesthetics, insulators, etc.

Since fluorine is so very near to the alchemists dream of a universal solvent, what vessel is going to contain it? One answer according to the Pennsylvania Salt Mfg. Co., the country's largest commercial manufacturer of fluorine, is that both Monel and nickel are outstanding in their resistance to fluorine attack. At moderate temperatures, iron, copper and magnesium vessels also will hold fluorine because an adherent fluoride film gives the necessary protection to the metal surface.

* * *

Aluminum Specifications Given in New Reynolds Booklet

INFORMATION on alloys, tempers, sizes, shapes, physical properties, chemical properties and fabricating characteristics is included in a new 194-page, pocket-size manual published by Reynolds Metals Co. There are also 117 tables of data on tolerances, weights, production limits, corrosion resistance, elevated and low temperature properties, fatigue strengths, minimum bend radii, joining methods (including welding and brazing) and finishes for aluminum. Some 33 pages of explanatory text are included.

Finest for Every Requirement . . .

Mid-States
AC ARC WELDERS

Model 300-U
10-300 Amps

HEAVY-DUTY
METAL ZIPPER

A complete welding outfit for every welding need . . . unequalled for all-around performance and efficiency . . . welds all metals, ferrous and non-ferrous, heavy, medium and light, even 22 gauge . . . does brazing, soldering, hard-surfacing and heating with ease . . . shown equipped with "Missing Link" automatic arc stabilizer for peak performance in AC welding . . . uses any type welding rod . . . even beginners do excellent work.

PORTABLE
JUNIOR

A small size, economical model for general use on construction job, production line, repair shop, factory or farm . . . has some rugged construction and superior transformer features of larger Mid-States welders . . . will meet the most exacting performance demands.

9000 ARC TORCH

Versatile torch to assure sound welds on all metals—ferrous and non-ferrous; permits brazing, soldering, hard-surfacing, heating, straightening and bending. For use with any AC or DC electric welder.

ZIP
SPOT WELDER

For 1001 jobs in shops . . . welds to ⅛" thickness of metal. Exclusive patented features include: fixed top tong, assorted lengths and shapes of tongs, adjustable curved tips and welding points for "hard-to-reach" spots; fully portable; easy to handle; ruggedly built; perfectly balanced; requires only one hand to operate. For 110 or 220 volts.

MISSING LINK
High Frequency Arc Stabilizer

For all welders, AC or DC—the "Missing Link" that permits inert gas shielded welding; eliminates pecking and scratching; starts arc automatically; permits the use of any type welding rod, AC or DC; simplifies all jobs; easily attached to any welder; models for 0-300 amp. and 0-600 amp. welders.

EVERY MID-STATES WELDER is engineered and constructed for finest performance over the years. Whatever you need for top-quality, economical welding you can depend on Mid-States. Ask for descriptive literature on the complete line.

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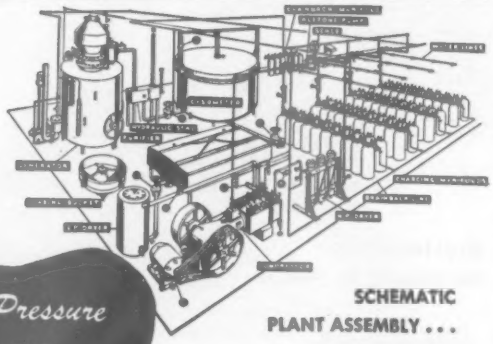

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PRODUCING
PLANT
that Charges up to
160 CYLINDERS
at ONE TIME

SCHEMATIC PLANT ASSEMBLY . . .

showing placement of the various units that comprise the plant.

This plant layout provides for extremely simple operation and exceptionally low maintenance costs. Ample storage space is also provided for filled tanks. Being compactly designed the chief operator has all operations under surveillance at all times. Rated capacity of this assembly is 2700 cu. ft. per hour.

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Welding Papers Presented at AIEE Winter Meeting

ARC and resistance welding papers occupied the Wednesday, Jan. 24, technical sessions at the winter general meeting of the American Institute of Electrical Engineers, Jan. 22-26 at the Hotel Statler in New York City.

R. W. Tuthill, General Electric Co., talked on the economical utilization of inert shielding gas in the inert-arc welding process. L. P. Winsor, Rensselaer Polytechnic Institute, presented a report of the subcommittee on fundamentals of electric arc research. The group is compiling a comprehensive bibliography of basic research on the welding arc. Jack Nater, Graham Mfg. Corp., discussed a stud-welding method employing stored energy.

For the afternoon resistance welding session, the presentation of papers was as follows: "Contact Resistance—the Contribution of Non-Uniform Current Flow," W. B. Kouwenhoven and W. T. Sackett, Jr., Johns Hopkins University; "Selection of Fuses for Resistance Welding Machines, C. B. Stadum, Westinghouse Electric Corp.; "Resistance Welding Transformers," Karl Sarafian, General Motors Corp.; "Magnetic Force Welder," Jerome Welch, Cutler-Hammer, Inc.; "Fusionette Welding Equipment," Harry Marx, Primeweld Corp. and "Welding Current Supply," C. W. Wright, General Motors Corp.

Among the papers presented by title only at the morning session, since they had been read at the 1950 Detroit Welding Conference, were the following: "The Physical Mechanism of Low and High-Current Arcs and their Relation to the Welding Arc," Wolfgang Finkelnburg, Engineering Research and Development Laboratories; "New Electrodes for Stabilizing Inert-Gas Welding Arcs," J. D. Cobine, C. J. Gallagher, General Electric Co.; "A-C Arc Welders with Saturable Reactor Control," S. Oestreicher, Harnischfeger Corp.; "Application and Developments in the Electric Arc Stud Welding Field," R. C. Singleton, Nelson Stud Welding Div., Morton-Gregory Corp.

• • •

Black & Decker Opens Bigger Buffalo Branch

A NEW sales and service branch at Buffalo increases facilities of The Black & Decker Mfg. Co. there by some 400%. The new construction was prompted by a considerable increase in the use of portable electric tools by the manufacturing and automotive service industries in the Buffalo area.

THE
ARC-FIT
PROCESS
Tube notched with special ARC-FIT
Angular notch on tubular member.
Square tube notched to fit square pipe.
Angle joint on two pipes.
"T" notch on end of Tubular member.
Pipe Notched with deep slot.
"T" joint on tube or pipe.
Angle Iron notched to fit pipe.

TOPS IN SHOP EFFICIENCY

5 seconds to notch Tubing and Pipe Ends

The answer to many problems confronting large and small shop owners. No shop can afford to be without the ARC-FIT—no matter how large or how small. Manual or power operated—fits the ARC-FIT hand press or any standard power press.

ARC-FIT is a patented precision-built shearing tool which prepares the ends of tubing or pipe to produce welded or brazed tubular "T" or angle joints. ARC-FIT will not deform the tube or pipe and no further finishing is required—no sawing, cutting, or removing sections with milling cutters. Our literature gives many fine points on operation, construction, and application—send for it today —also write for quotations.

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CHICAGO 47, ILLINOIS

Titanium Welding Tested by Boeing Airplane Co.

RECENT fabricating and forming tests on titanium at Boeing Airplane Company, Seattle, indicate its forthcoming use in aircraft structures. Since cutting of weight without losing strength is always the primary problem of aircraft designers, titanium offers alluring possibilities. Strong as stainless steel aircraft parts, it weighs 43% less and offers added resistance to corrosion.

Titanium can be readily welded by the inert-arc-gas-shielded process as well as by spot and seam resistance welding. Brazing of titanium has not been successful because of a tenacious surface oxide that forms with the addition of heat. Welding of the new metal to steel, copper, aluminum or magnesium also presents difficulties because of its relatively high melting point (3,140 F) compared to stainless (2,550 F), copper (1,981 F), aluminum (1,220 F) and magnesium (1,204 F).

* * *

Integrated Steel Plant Planned by Lone Star Steel

IMMEDIATE construction of a completely integrated steel plant in East Texas is planned by Lone Star Steel Company, Dallas, Tex. It will be located next to the firm's present blast furnace, coke ovens and reducing facilities.

Lone Star officials say it will be the tightest knit operation of its kind in the world. Iron ore is mined within sight of the blast furnace. Coal is dug in company mines only 200 miles from the plant site. Consumption of a major portion of the company's production is expected to take place within a 300-mile radius of the plant. A government loan of $73,425,000 has enabled the new expansion.

The rolling mills to be installed will turn out plates measuring 44 by 110 in. These plates will be converted by a Steckel mill into coiled strips.

Welded piping in diameters from 2 to 16 in. will be produced from the coiled strip. A production of 350,000 tons of welded steel pipe is seen by company officials when the steel mill is in full swing.

* * *

Distributors

HANNA ENGINEERING WORKS, Chicago: Indusrial Air & Hydraulic Equipment Co., L3306 Kercheval Ave., Detroit, will sell Hanna products in Michigan (east of Lake Michigan).

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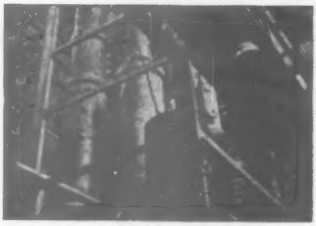
We mean waiting for the new Cyc-Arc stud-welders, which you saw at the A.S.M. Exposition in Chicago last October and which will soon be coming off an American production line streamlined to suit discriminating welding engineers.

WE'LL TELL YOU!



(1) Cyc-Arc patented studs and attachments will cost you less.
(2) You'll get sound and consistent welds in ferrous and non-ferrous metals including aluminum with minimum of fuss and without inert gas.
(3) You'll have a machine incorporating over 30 years stud-welding experience in its design.

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4. Deteriorated cast iron can always be welded successfully with "York's 77".

YORK ENGINEERING COMPANY
3349 OGDEN AVE. • CHICAGO 23, ILL.

30 YEARS AGO

(From THE WELDING ENGINEER of March, 1921)

OXYACETYLENE repair of the aluminum motor base, crank case and gear case of a Mack truck has been reported. The three parts were broken into a total of 18 pieces. Special jigs were needed to hold the parts in alignment for welding.

—30 YEARS AGO—

ARC welded pressure vessels recently welded by the Standard Oil Company at Whiting, Ind., have withstood pressures of 1,800 psi. Bare wire electrodes of 3/16 to ¼ in. diameter on 200 amp current were used for welding.

—30 YEARS AGO—

MOVING pictures were taken of a recent Thermit weld repair on a broken rock crusher at a quarry near Hartford, Conn. Industrial films of this type are becoming more popular every day for instruction and sales uses.

—30 YEARS AGO—

CAST-IRON scrapping has become more profitable recently because of the year-old method of applying oxyacetylene cutting to large castings. A New Jersey chemical company recently cut down two 25-ton cast iron pots having 3 in. thick walls in 34 hours cutting time.

—30 YEARS AGO—

NEW rail-bonding machine consists of an arc welder specially modified for welding rail-bonds in street railway or electrified railroad lines. It is designed to operate directly from a trolley circuit. The type of bond used has a steel face welded to a drop forged copper terminal, so the field weld is steel to steel.

—30 YEARS AGO—

UNIQUE flame-cutting job completely done inside a 90-ft high masonry chimney has come to our attention. The masonry chimney had been built around the original steel chimney when a larger draft was needed. It was found the steel stack hampered the draft though, and the oxyacetylene cutting operator had to be lowered down inside the stock to do the job.

—30 YEARS AGO—

RISING prices the last several years have not affected the steadily decreasing price of compressed oxygen. Better methods of oxygen manufacture and the progressive attitude on behalf of oxygen producers that low prices will further expand welding and other uses of oxygen are responsible.

About People

A. F. "CHARLIE" DAVIS, vice-president and advertising director of The Lincoln Electric Co., Cleveland, has been named industrial advertising's man-of-the-year for 1950 in an annual competition conducted by the magazine *Industrial Marketing*.

* * *

WILLIAM K. HONAN, Glastonbury, Conn., has been appointed a regional manager of sales in New England, New York State (north of Westchester County), western Pennsylvania and Ohio for All-State Welding Alloys Co., White Plains, N. Y.

* * *

ARTHUR T. DALTON, secretary of Chicago Wheel & Mfg. Co., Chicago, has been appointed to the advisory committee, Abrasive Industry, of the National Production Authority.

* * *

CHARLES EISLER, president of Eisler Engineering Co., Inc., Newark, N. J., has received the honorary degree of Doctor of Science from Bloomfield College and Seminary, Bloomfield, N. J.

* * *

A. G. HENDRICKSON joined A. O. Smith Corp., Milwaukee the first of the year as welding equipment sales manager under the direction of L. F. VONIER, welding division sales manager.

* * *

LOUIS M. HARDNACK has been appointed general manager of The General Welding Co., Cleveland. He was formerly methods and welding engineer of the fabrication and welding division of Thew Shovel Co., Lorain, O.

* * *

E. R. WALSH, III, has been appointed general sales manager of Alloy Rods Co., York, Pa.

* * *

CHARLES SMITH has been named manager of the Chicago branch of Victor Equipment Co. Mr. Smith is a hard-facing applications specialist with experience in shipyards and steel mills besides previous sales work with Victor in California.

Scales and cleans welded joints easily

Don't Underestimate the power of the BANTAM BULLY!

13,000 sharp, effective blows a minute! ...sharp enough to cut cold rolled steel!

The amazing Bantam Bully air hammer gives you real power in an easy-to-use size. It is 5" long and weighs only 22 ozs. Exclusive metering trigger regulates the power from a feather touch to a powerful blow. Full speed and power attained on less than 6½ C.F.M. of air.

Use it for scaling, chiseling, peening, tamping, cutting, routing, grooving, caulking, channeling, chipping, driving, drilling, marking, and hundreds of other applications.

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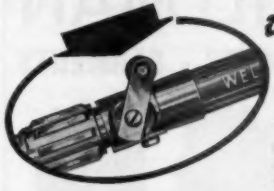
for Mass Production Welding

there's no torch like the

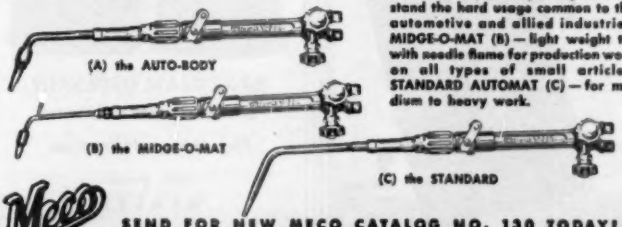
Meco AUTOMAT



The famous MECO "On-Off" Action (above) allows a tiny pilot light to burn at the tip with the action in the "off" position. At a touch it flashes to full production flame. Action tested over 200,000 times without appreciable sign of wear.

For mass production there is no such thing as a good all-round torch. Time and motion studies have proved that for efficient production welding, the torch used must be fitted to its particular job. The Meco AUTOMAT family — embodying the famous MECO "On-Off" action (oval), is perfectly suited to the start and stop welding so common to production. The importance of this time saving feature to mass production work is apparent. Beyond this, each member of this family has built-in features perfectly suiting it to its own particular class of welding.

AUTOBODY (A) — especially built to stand the hard usage common to the automotive and allied industries. MIDGE-O-MAT (B) — light weight tip with needle flame for production work on all types of small articles. STANDARD AUTOMAT (C) — for medium to heavy work.



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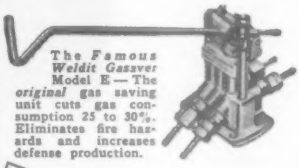
Weldit Weldimatic torches are indispensable for defense work because they will increase your production up to 148% plus an average gas saving per operator of $4.80 per day.

The Weldit Model W-46 Weldimatic welding torch with built-in automatic gasaver. *Safe — Speedy — Rugged—Light.*



The *Famous Weldit Gasaver* Model E — The *original* gas saving unit cuts gas consumption 25 to 30%. Eliminates fire hazards and increases defense production.

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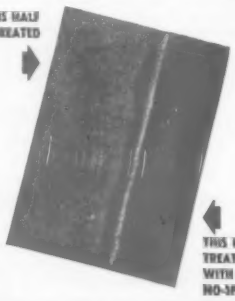

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The stay soft leather
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WILLIAM G. GERSTACKER has been named chief engineer of The Colonial Iron Works Co., Cleveland. He is a registered professional engineer, a member of the American Welding Society. In 1942 he won an award in the James F. Lincoln Arc Welding Foundation Award Program.

* * *

C. R. CARLIN has been elected vice-president in charge of production of the Alloy Rods Co., York, Pa. R. K. LEE was elected vice-president in charge of research and engineering. Other officers elected were E. J. BRADY, president and chairman of the board, M. G. SEDAM, executive vice-president, W. D. HIMES, treasurer and H. L. WEAVER, secretary and assistant treasurer.

* * *

HENRY G. FIEGER has been appointed shop manager for Dravo Corporation's fabricated piping plant at Marietta, O.

* * *

EVERETT S. LEE, nationally known electrical engineer, has been appointed editor of the *"General Electric Review,"* monthly engineering magazine published by the General Electric Co.

* * *

ISAAC HARTER, chairman of the board of The Babcock & Wilcox Tube Co., Beaver Falls, Pa., received the Newcomen Medal Jan. 17 at a joint meeting of the Newcomen Society and The Franklin Institute in Philadelphia. He helped develop welded joints in boiler drums, won this type of boiler acceptance from the U. S. Navy and also developed the use of X-ray testing of boiler joints.

* * *

Died . . .

A. CRESSY MORRISON, former secretary-treasurer of the International Acetylene Association and retired executive of Union Carbide and Carbon Corp., died Jan. 9, at the age of 86. Mr. Morrison was an outstanding pioneer in the production and safe use of gases, particularly acetylene. He was a member of the American Academy for the Advancement of Science and many other national and international scientific organizations.

* * *

WALTER GEIST, president of Allis-Chalmers Mfg. Co., Milwaukee, died Jan. 29 at the age of 56. He first worked for Allis-Chalmers in 1909 and was its president since 1942. The company's multiple V-belt "Texrope" drive was developed by Mr. Geist.

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ON A HARGRAVE WELDERS' CLAMP

NO. 41 LIGHT SERVICE

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SPRING CLAMP

For spot welding and other light duty welding. Holds firmly, releases instantly. Useful where speed is needed. Every shop needs a few.

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Hargrave Nos. 41, 43 and 45 Welder's Clamps resist spatter permanently because the Patented screws are made of an anti-spatter, solid alloy material—not to be confused with ordinary plated types of screws. They speed your work . . . ease the job and give years of trouble-free service. Frames are forged steel, heat-treated and designed to give greatest strength for weight. Oscillating (ball and socket) tip is put on to stay. Each clamp is Individually Tested. Openings in all popular sizes.

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There is an Industrial Distributor Stock near you.

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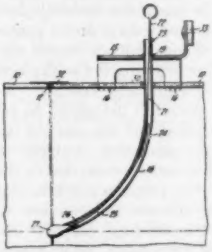
The Cincinnati Tool Co.

1944 Waverly Ave.
Cincinnati 12, Ohio

From the Patent Office

Radiographic Pipe Inspection

2,539,102. RUSSELL G. RHOADES, San Francisco. Assigned to Bechtel Brothers McCone Co. Originally filed June 24, 1946. Divided and this application Dec. 2, 1946. Granted Jan. 23, 1951.



Newly patented jig for positioning radiation emanating material in the radiographing of cylindrical pipe joints includes a support for holding it stably on the upper surface of the pipe. A tube is secured to the support and has its lower end positioned at a spot below the support and beyond the area that the support overlies. An extensible spring is disposed within the tube and is connected to it at one end for holding the radiation emanating material in position at the lower end of the tube.

* * *

Welded Pipe Joint

2,538,882. HARRY E. SCHONBERG, Indianapolis, Ind. Assigned to The Linde Air Products Co. Filed Sept. 20, 1945. Granted Jan. 23, 1951.

This patent refers to a weld joint used in metal storage containers for fluids under pressure. The container has curvilinear side walls welded along a girth seam. The metal in the zone of the weld possesses the metallographic structure characteristics of metal welded under pressure at a temperature not substantially higher than the solidus temperature of the metal. The container has an external annular ridge of upset metal along the zone of the weld that provides a permanent circumferential reinforcement.

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U.S. Patents 1,876,738—1,947,167—2,021,945

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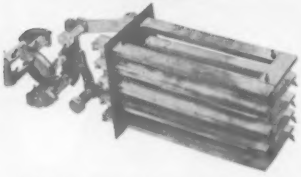

EUTECROD 1800 DOES "IMPOSSIBLE" JOB WITH EASE. In the magnet charger shown above, 23 copper joints had to be welded *without distortion*, for the cumulative effect of even the slightest warpage per joint would ruin the job. This seemingly impossible metal-joining problem was easily solved with EutecRod 1800—the fast-flowing, high conductivity, high strength "Eutectic Low Temperature Welding Alloy" that welds steel, copper, and nickel units that demand *distortion-free* elasticity. *(Write for complete data.)*

EUTECROD 16 STRENGTHENS RESCUE LADDER CONSTRUCTION. The Curtiss-Wright "Seahawk" collapsible ladder shown in the photo is constructed in cross-sections that swing together on hinges. Previous attempts to weld the ladder joints with conventional high-heat alloys resulted in misaligned structure that rendered the ladder unsafe. This unusual metal-joining problem was solved by using new EutecRod 16 and slight design modification. *(Details on request.)* The parts thus joined remained distortion-free and strong, surpassing the rigid Navy equipment requirements.

"EUTECTIC Low Temperature WELDING ALLOYS" are setting new standards for production and maintenance welding everywhere. Drawbacks of conventional brazing and fusion welding—such as distortion, warping, porosities, and weld failures — are minimized or completely eliminated when you use EUTECTIC's JOB PROVED hi-tensile low melting alloys.

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EUTECTIC WELDING ALLOYS CORPORATION

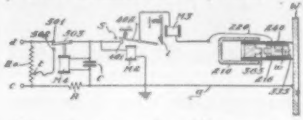
Technical Information Section

40-40 172 STREET FLUSHING - NEW YORK, N.Y.

Independent Pioneer of the Welding Industry

Stud Welding Apparatus

2,537,990. HAROLD J. GRAHAM, Highland Park, Mich. Assigned to Graham Mfg. Corp., Detroit. Filed June 1, 1949. Granted Jan. 16, 1951.

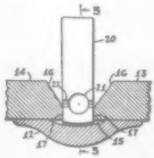


Recently patented welding apparatus includes energy storing means of the type that re-establishes operative voltage after discharge. There are also means for positioning two work pieces to be joined relatively to each other in place for welding but at a distance preventing direct contact between them. Impact means are provided for bringing the workpieces into force transmitting contact. A conductor connects the pieces to respective terminals of the current supply. Normally separated contacts are arranged in series connection in the conductor for preparing when closed a welding circuit independent of the force-transmitting impact contact. Voltage responsive relay means are connected to the storing means for closing the contacts independently of and prior to the impact contact upon re-establishing of the operative voltage.

* * *

Break-Off Ring

2,537,776. ARTHUR R. C. MARKL, Louisville, Ky. Assigned to Tube Turns, Inc. Filed April 2, 1946. Granted Jan. 9, 1951.



Patent refers to a device for aiding the welding of two sections of piping. It includes an expansible ring formed of a metal band. A number of spaced outwardly extending studs are intermediate of the side edges of the band and around the periphery of the ring. Each of the studs is of greater length than the wall thickness of the tubular members (piping) to be welded. Each stud has a weakened point at a distance from the band less than the wall thickness of the piping. The piping sections may be telescoped onto the ring and against the studs. After the two sections are tack welded together, the studs can be broken off at the weakened points within the space between the ends of piping.

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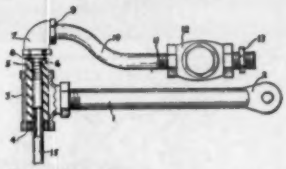
THE PIERCE GOVERNOR CO., INC.
1607 Ohio Ave. Box 1000 Anderson, Indiana

Underwater Cutting Arc

2,531,450. ZYGMUNT A. MACKIEWICZ, United States Navy. Filed Aug. 11, 1944. Granted Nov. 28, 1950.

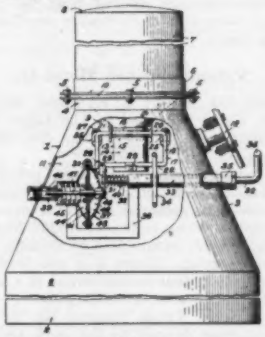


Patent pertains to an oxy-arc torch made from a length of standard steel pipe with a flattened end bored through for an electrical connection. A standard T-connection on the threaded end of the pipe has a bushing screwed in it. A piece of oxygen hose is pushed in through the other end of the T and extends down to the bushing. A short end of this hose projects from the T. A. standard elbow fitting having a half of a hose splice fitting is brazed to one end thereof, and a piece of copper tubing brazed to the other end thereof. The hose splice fitting is inserted into the projecting end of the oxygen hose. An oxygen valve has one side connected to the other end of the copper tubing and has a double male fitting for connection to an oxygen supply at its other side. A clamping screw fits through the T and the bushing for clamping a tubular electrode.

• • •

Splash Shield Closer

2,533,117. CHARLES M. JOHNSON, Lubbock, Tex. Assigned to R. C. Johnson, Jr., Lubbock, Tex. Filed June 9, 1948. Granted Dec. 5, 1950.



Newly patented feature for an acetylene generator improves the splash shield action of the device. The splash shield is a flexible tube that carries the carbide from the storage hopper to the tank. The improvement is a clamping device for the shield that tends to hold the passage closed. There are means externally accessible for opening the clamp. Latch means include an element movable with the clamp between its open and closed positions. A plunger member is engageable with the element in the open position of the clamp to hold it open.

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SALVAGE WELDING TIME CUT MORE THAN 90% WITH NEW EUTECTIC WELDING ALLOYS

When a leading research institute's tensile testing machine was overloaded, the top snapped completely off the two side members. At first, the old-fashioned conventional high heat fusion methods were tried. The entire operation—pre-heat, slow cool, etc.—consumed 48 hours in all; and, on the first day after its repair, the casting cracked wide open again, through and alongside the welding area. It seemed as though the entire casting would have to be scrapped. Before taking this costly step, Eutectic was consulted . . .

The damage was repaired permanently with EUTECTIC's BIG TEAM — CutTrode + EutecTrode 24, for cast iron. CutTrode—a new special metallic-arc oxygen-less cutting electrode first beveled the breaks, in preparation for welding. Sufficient residual heat remained from the use of CutTrode to weld the entire job without any further pre-heat. The breaks were first tack welded; then stringer beads were deposited with new EutecTrode 24. The entire job—permanently welded—was accomplished in only 4 hours—1/12 *THE ORDINARY WELDING TIME!* (Complete details and photos of this job available on request.)

"EUTECTIC Low Temperature WELDING ALLOYS" are setting new standards for production and maintenance welding everywhere. Drawbacks of conventional brazing and fusion welding—such as distortion, warping, porosities, and weld failures — are minimized or completely eliminated when you use EUTECTIC's JOB PROVED hi-tensile low melting alloys.

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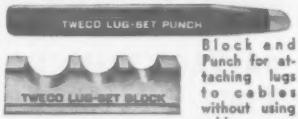
FOR WELDING CABLES

New copper solder type TWECOLUGS are especially designed for making welding connections. They have large diameter stud holes with ample wing nut clearance. Four sizes for cables 6 through 4/0.

TWECO "LUG-SET"



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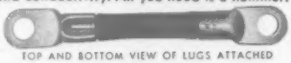

TOP AND BOTTOM VIEW OF LUGS ATTACHED WITH TWECO "LUG-SET"

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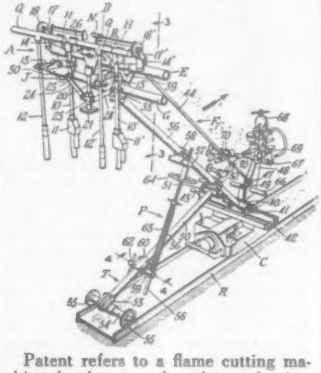
Flame-Cutting Machine

2,528,809. Lloyd W. Young, Elizabeth, N. J. Assigned to The Linde Air Products Co. Filed March 20, 1946. Granted Nov. 7, 1950.



Patent refers to a flame cutting machine that has a torch and a mechanism for supporting it in relation to the work. The mechanism includes a device attachable to a carriage movable relative to the work. A frame member has one end pivotally connected to the device. Means for mounting the torch are on the other end of the frame. Adjustable means are adapted to cooperate with the pivoted frame member to press the torch toward the work. The adjustable means include a rigid trailer member pivotally connected to the frame member at a point between such ends thereof and spaced from the pivotal connection of the frame. Bracing means are connected to both the frame member and the trailer member at points severally spaced from the pivotal connection of the trailer member to the frame.

* * *

Submerged-Arc Metal-Arc

2,532,411. Harry E. Kennedy, Berkeley, Calif. Assigned to The Linde Air Products Co. Filed Oct. 29, 1949. Granted Dec. 5, 1950.

Patent covers a constant potential metal-arc welding system that requires a constant potential source of current supply of the order of 19,000-81,000 amperes per square inch of welding rod cross section. There is a rod feeding mechanism that feeds the rod at a constant rate toward a welding zone of the workpiece. Leads connect the source of current directly to the work and to the electrode. The welding arc fuses the end of the rod and the adjacent metal of the work. A granular flux medium is supplied to the welding zone. This flux stabilizes the arc in this current density range (19,000 to 81,000 amp). For a rod of given size the amount of welding current inherently depends upon the speed at which the rod is fed toward the welding zone. The resulting welding operation is so stable that the need for rod feed and voltage controls, as well as stabilizing resistors and reactors in the welding circuit, is eliminated.

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700	3/32"	Arcos	19-9
50	3/32"	Page	25-20
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850	1/8"	Murex	18-8
10,500	1/8"	Page	18-8
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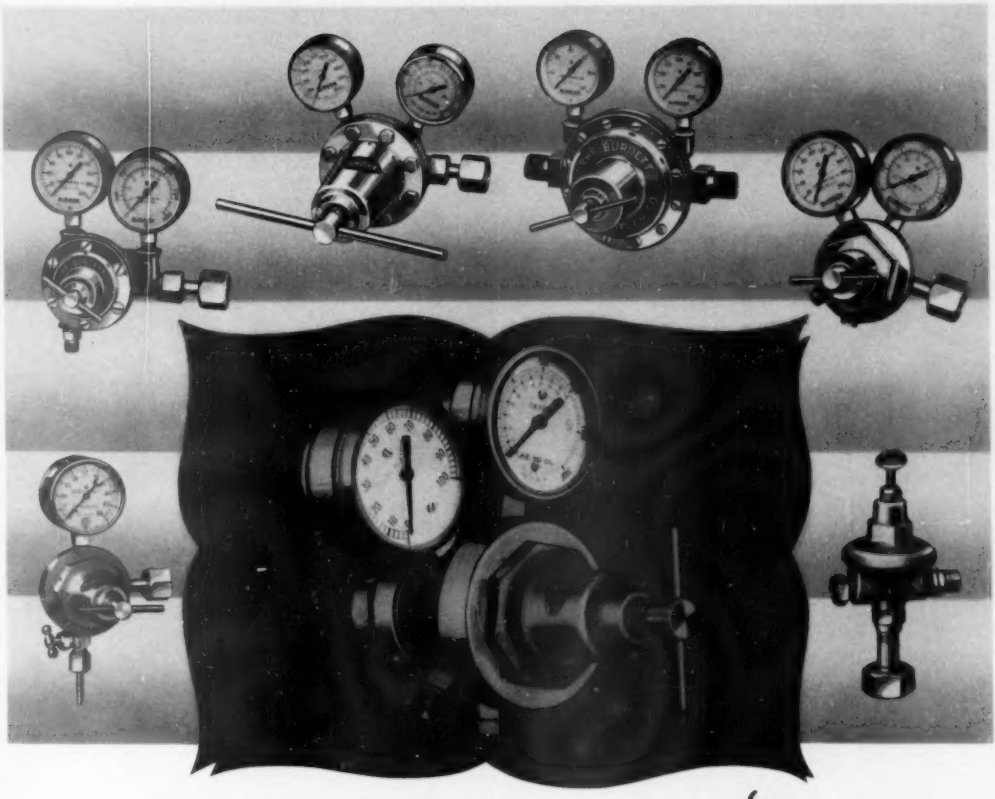

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